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ABSTRACT

This report from the Centre for Educational Research and Innovation (CERI) presents responses to a questionnaire and supporting documentation from 107 universities and 22 member countries of the Organisation for Economic Cooperation and Development (OECD). The survey covered 154 projects on teacher training, research, and evaluation in information and communication technology conducted between universities and primary and secondary schools. The first of two parts of the report begins by covering the context of the survey, including two levels of expertise for teachers in the pedagogical uses of information technologies; the role of universities in teacher training; and the objectives and organization of the survey. It then focuses on analysis, including the basic data on the projects; the main issues in their implementation (compensation of teachers' time, status of research and development, interdisciplinary and new educational technologies, and communication between researchers and teachers); improvement in cooperation between partners; and an increasing role for universities. A copy of the questionnaire is appended. Part II, which makes up the larger part of the report, presents fact sheets on projects in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Each fact sheet provides the name of the project, a contact person, the duration, funding, associated universities, the aims of the project, its implementation, and its products. It is concluded that the results of the work to date show that the potential of the new information and communication technologies for improving learning and teaching will not be realized unless teachers are well trained and retrained in the pedagogical use of technology in the classroom. (ALF)

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Education and New Information Technologies
Teacher Training and Research

A Survey of Co-operative Projects between Universities and Schools

CENTRE FOR EDUCATIONAL RESEARCH AND INNOVATION

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EDUCATION AND NEW INFORMATION TECHNOLOGIES
TEACHER TRAINING AND RESEARCH

A SURVEY OF CO-OPERATIVE PROJECTS BETWEEN UNIVERSITIES AND SCHOOLS

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

PARIS 1992

As part of ongoing work on Education and New Information Technologies, the CERI Governing Board agreed that an analysis should be undertaken of "significant projects of teacher training, research and evaluation in the effective use of information and communication technologies in the classroom, specifically those co-operative projects which link universities and other higher education institutions with the schools". The Secretariat therefore invited Member countries to help to identify examples of such projects. Responses to a questionnaire and a wide range of supporting documentation were received from 107 universities in 22 Member countries. The responses which have been analysed by the Secretariat cover 154 co-operative projects between universities and primary and secondary schools.

The report is in two parts. In Part One, the context of the survey and the analysis of the co-operative projects between universities and schools are presented. Main issues concerning the co-operation between universities and schools are also discussed. Part Two regroups the one-page fact sheets which have been established for each of the 154 projects.

Following the recommendation of the CERI Governing Board, the Secretary-General has agreed agreed to make the report available to the public on his own responsibility.

Contents

SUMMARY

The results of work to date have been conclusive: the potential of the new information and communication technologies for improving learning and teaching will not be realised unless teachers are well trained and retrained in their pedagogical use in the classroom.

Initial training, based upon the best practices of the uses of technologies which have been identified in schools, is a necessity. Yet, in only a few countries is such training a compulsory part of the teachers' programme. This is a very serious problem as these teachers, inevitably will be, sooner or later, confronted by the need to use technologies with their students. Nevertheless, for the time being, the main problem will remain providing re-training for teachers already in the classroom. The reason is that the rate of recruitment to teaching in many countries, although increasing, remains low. In-service training will therefore serve as the principal means to develop the level of teachers' expertise (OECD, 1992).

In many countries, existing in-service training focuses on providing teachers with a basic knowledge of the hardware and of educational software. This training is organised through short courses provided away from the school or through formal arrangements within schools (e.g. the "cascade model" where well trained teachers are expected to train their colleagues). But this familiarisation with the technologies is not sufficient: the real challenge is the training of teachers in the uses of interactive technologies for non-trivial applications in the classroom, such as simulation and model building, problem-solving, complex microworlds or exploration and discovery and even judicious uses of basic software packages such as word processing, spreadsheets or data bases.

Training for this purpose is complex because knowledge about *what* a given student might learn and *how* he/she learns when using such software is only slowly being developed; it is in fact being mainly created at the classroom level by teachers who are acting as researchers, analysing the actual effects of different software packages, and experimenting with alternative ways of using them. Hence the strategy formally to link in-service training of teachers with research.

Research on learning with information technologies is being conducted by various institutions, ranging from education, the military, and private sector enterprises to foundations. The present report argues that universities and other higher education institutions should be the major partners of schools in contributing to the in-service training of teachers trough collaborative research: the universities have a considerable knowledge of the learning and teaching processes, including with computers, and because of their service function to society, they have a specific responsibility to share part of this knowledge with schools.

Co-operative projects between universities and schools therefore are and should be developed. Many of them shows the great potential of "action research" for in-service teacher training, but also the advantage for university research on learning and teaching to be anchored in real classroom situations.

But there are difficulties inherent in this co-operation. First, the two partners have different cultures, different skills and expectations. It takes time to establish true co-operation on an equal footing based upon recognition of complementary competences and the value of co-operation for both partners. Secondly, each of the partners is confronted with specific issues within their own institutions.

In schools, teachers ask for more release time and better compensation for the extra time spent on working for the co-operative project. They would like also action-research in their classrooms, to gain more recognition. In universities, researchers ask for the support of senior authorities concerning school-based research and development undertaken with teachers. They consider also that interdisciplinary research in learning with information technologies should have the same status as basic research in the traditional disciplines.

Finally, universities and schools would like national educational authorities to give more consideration to those co-operative projects which permit the improvement of both training of teachers, research and practice and the creation of new and fruitful relationships between the two institutions. One way of doing this is would be to increase their financial contributions to the implementation of the projects. Shortage of funds is a major source of complaint by both partners.

Part One

CONTEXT AND ANALYSIS OF THE SURVEY

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Chapter 1

CONTEXT OF THE SURVEY

I. Teacher training in the pedagogical uses of information technologies: two levels of expertise

Previous OECD work in education and information and communication technologies (1) and national evaluation studies undertaken in Member countries (2) have reached the same conclusion: the potential for improving learning and teaching will not be realised unless teachers are well trained and retrained in the uses of the new technologies in the classroom. Two levels of knowledge and expertise required of teachers who are to use computers in the classroom have been identified: these relate to *hardware and software*, and the *pedagogical applications* of new information technologies.

With respect to the *hardware*, teachers must be able to operate a microcomputer and to master ordinary techniques such as entering data, as well as to set up and manage to the best advantage the hardware available in the classroom. As for *software*, teachers need to develop competence in the range of applications offered by the computer. These include: ability to use computer-based learning packages and the various types of professional software (e.g. word processing, spreadsheets, databases); ability to identify the sources of appropriate educational software; capacity to use national and local computerised educational databases and communications systems to search for and obtain software; and ability to evaluate software.

In most OECD countries, *pre-service and in-service training is more and more available for this first level of expertise*. But the courses tend to be short; they are provided outside of the schools, very often without direct connection with the subject matter to be taught and without taking into account the specific pedagogical practices of individual teachers. Furthermore, they do not, in general, provide access to the types of hardware and software which are available in the schools. As currently structured, these courses offer little more than an introduction to the use of new information technologies in education. With the expanding use of computers and technologies in society, many current or future teachers have now acquired a certain familiarity with devices and their operations and, in the near future, these formal introductory courses given outside schools may prove to be no longer necessary.

The second, and key, level of pre-service and in-service training of teachers is concerned with *the pedagogical uses of technologies in the classroom* or related pedagogical tasks. The obvious general implication is that teachers need to be able to convert the potential of computer-based learning into actual classroom use by individual students. They must be able to integrate appropriate student use of computers and related devices into their teaching, whether in the laboratory or the classroom; to identify software which is relevant to their students' learning and to suggest the most appropriate ways to remedy pedagogical and technical weaknesses they discover; and more generally, to use computers for developing new learning activities, assessing and monitoring student progress and diagnosing mistakes to permit continuous corrections and adjustments.

Training at this second level is critical, yet difficult. Experience in many parts of the world shows that much of the training of teachers in the use of interactive information technologies is generally ineffective, because it does not develop knowledge of what a given student might learn and how he or she learns when interacting with the technologies. In a general sense, apart from applications in routine tutorials or drill and practice, the teaching-learning process is affected by the use of new technologies. The effects are particularly pronounced with highly interactive environments, such as simulation and model building, problem-solving, complex microworlds or exploration and discovery. If creatively used, even more basic software packages, such as word processing or databases, could also improve the learning of higher order thinking skills. The use of new technologies to help pupils develop these skills has not yet received sufficient consideration. However, applications in this area presuppose teachers trained in metacognitive processes.

Teachers can also use the computer to monitor student achievements by using computer-managed instruction software. They should also be aware that the computer is an important research instrument to diagnose individual learning difficulties or to dispel typical misconceptions held by all students in the classroom. Because all the transactions and learning conversations are machine mediated, a complete record of the student's pattern of response is produced in a machine-readable form. The use of such records pre-supposes that teachers have been appropriately trained in cognitive psychology.

Information technologies also have implications for the organisation of individual subject areas across the curriculum, including possible changes in: a) the chronological organisation of learning (i.e. in the traditional organisational sequence of a course); b) the content of subject matter (i.e. less attention on declarative knowledge – teaching and learning the facts – and more emphasis on procedural knowledge); c) types of learning opportunities (i.e. access to educational resources by using telecommunications technologies at the classroom, school, national and international levels). These changes, and the implications for what teachers should know, differ by level of schooling. Teachers in elementary schools are better placed to develop interdisciplinary approaches because they are responsible for all subjects and because computers are generally located in the classrooms. In secondary schools, teachers can consider changes in the contents and organisation of teaching particular subjects, including the sequences which should be followed, but they should be aware of the potential of information technologies for linking different subject matters.

Despite the clear need *to prepare teachers for this second vast and complex level of expertise, i.e. the pedagogical uses of interactive information technologies*, in only a very few countries is such teacher training a compulsory part of pre-service and in-service development programmes.

Pre-service training, based upon the best practices which have been identified in schools, is a necessity, as all teachers newly trained will sooner or later be confronted with the need to use computers in their teaching. But as the overall rate of recruitment to teaching in many countries, although increasing, remains low, *in-service training* will for the immediate future serve as the principal means to develop the level of teachers' expertise. Changes in the demographic profile and in post-compulsory age retention rates will lead to a renewed emphasis on initial teacher education as the nineties progress.

At present, most *in-service training* is organised through courses provided away from the school or through formal arrangements within schools. But real difficulties tend to be encountered when teachers first use computers for non-trivial and interactive applications. It is at this point that support is needed. However, "the most disturbing feature of our present stage of development is that it is the teachers themselves who are pioneering new approaches to practical pedagogy. Knowledge about how computer enhanced environments work is only

slowly being developed; it is being created at the classroom level by teachers who are acting as researchers, analysing the actual effects of different software packages, and experimenting with alternative ways of using them" (OECD 1988).

A clear conclusion is therefore that in-service and continuous training cannot be isolated from classroom reality, i.e. the level of education, subject matters, individual teaching strategies, student learning objectives, the students' styles *and that this training should be closely linked to research and development activities in the learning processes involving inter alia information and communication technologies.*

II. The challenge of teacher training in information technologies: which role for the universities?

Various research institutions are concerned with questions raised by the introduction of computers in schools, particularly with aspects of how children learn with the new technologies. Research takes place in public and private education agencies (universities and other educational research centres), but also in other sectors such as industry, technology, telecommunications or the military (research undertaken directly by them or contracted, as is the case for the U.S Office of Naval Research). Private enterprises are also active, not only those manufacturing computers. Foundations also play a role, as for other educational research.

But, at least in the public sector, resources allocated for research and development in educational applications of new information technologies appear to be low in relation to the potential these applications represent for improving educational results. In 1988, the Office of Technology Assessment of the US Congress (2) concluded that Federal funding for research and development which affects educational technology "... accounts for total spending of approximately $240 million per year, never approaching the billions committed to other major categories of technology-related R&D" and that "Congress needs to consider a substantial Federal investment in R&D to exploit more fully the power and potential of technology for education". This reflects a generally low rate of public investment in educational R&D.

In spite of the diversity of groups engaged in this research and the low level of funding, universities and other higher education institutions seem well placed to play the leading role. A survey conducted by the OECD in 1984 of more than 100 universities indicated that this was not the case in practice. New developments have occurred since that time, but one of the reasons for the lack of involvement of most universities in research into the pedagogical uses of information technologies is that it has low status, attracts less external support than other activities, and brings low rewards to the researchers involved. Furthermore, many aspects of this research are difficult to organise (e.g. those on complex cognitive issues or on prototypes of intelligent instructional systems), as they demand an interdisciplinary approach ranging from education, developmental psychology, cognitive science and computer science to artificial intelligence.

In parallel to this leading role in research, it is arguable that universities and other higher education institutions should have more responsibilities for pre-service and in-service training in general. These responsibilities seem, in fact, to be increasing in most although not all countries. In the specific area of new educational technologies, many universities provide, through their schools of education or computer science departments, short pre-service courses to develop computer awareness. They provide also various levels of in-service training to teachers who are then expected to initiate their colleagues when they return to their schools.

This is the well-known "cascade model" which predominates in training within Member countries. Whatever the organisation, pre-service and in-service training provided within universities is generally limited to developing for teachers a first level of expertise in hardware and software.

One response to the challenge described above of training teachers to the second level of expertise, namely the *pedagogical uses* of information technologies, is to develop co-operative research and development projects between universities and primary and secondary schools. By working on such projects, teachers will be trained through "action-research" in their own classrooms while university researchers will increase their research effectiveness and produce more relevant findings. The example indicated above in para. 6 on the use of the computer to detect learning difficulties and misconceptions is self explanatory: the teacher organises the records of students' responses and communicates them to researchers. The information contained in these records opens up possibilities for more rigorous and detailed empirical research on learning processes to match the elaborate theoretical work now being done in university research laboratories (OECD 1987). Many projects of this type are indicated in the present report.

The broad conclusions reached in CERI work on Teacher Education (3) find a ready echo in the specific area of computers in education:

> "The results of research will be underused or misused if the experiences of teachers and the circumstances and settings in which they work are ignored. This consideration suggests that research on teaching and learning must not be separated from the teacher or from the classroom. At one level, the problem is one of grounding research in the disciplines in the reality of the schools. At another level, the problem is one of introducing the results of such research into the curriculum of teacher education programmes in ways that ultimately encourage and enable individual teachers to apply the new knowledge in their own practice".

The view taken in this report is that universities and other higher education institutions should provide leadership in research and development, in teacher training, in quality software development and in evaluation. Obviously, co-operation between primary and secondary schools and others, in particular private companies, is useful, but universities should remain the main partners of these schools in order to help them to introduce successfully information and communication technologies for improving learning and teaching. They have knowledge and they are in a position develop it. They have also material and human resources (including university students). Finally, as stressed in previous CERI work (4) universities have a 'responsibility' in the economic, social and cultural development of the community. In forging co-operative activities with schools, universities can fulfil 'public service' roles, in parallel with and complementary to, primary teaching and research functions.

III. Objectives and organisation of the survey

Against this background, the objectives of the CERI survey were:

i) To identify, with the help of Member countries, examples of co-operative projects in learning and teaching with information and communication technologies which are undertaken by researchers in universities (and other higher education institutions) and teachers in their schools/classrooms;

ii) To collect and to analyse data about these projects;

iii) To bring to light the main issues raised by co-operation between the two partners – the universities on the one hand and the primary/secondary schools on the other.

In April 1990, the Secretariat requested national authorities to name examples (between 1 and 15 cases) of co-operative projects between universities and schools and to provide a list of universities and other higher education institutions likely to be interested in the survey. A Secretariat note (CERI/NTI/90.01) was sent to national authorities to assist them for this purpose. The note described the main problems relating to teacher training in information technology and the reasons for giving universities a greater role in this area. Between June and October 1990, almost all (22) Member countries submitted information on higher education institutions which could usefully be included in the survey. Obviously, it is difficult for a country to identify innovative projects, in particular when they are not financed by public funds. Their lists did not therefore attempt to cover all the most interesting projects. Nevertheless, with the information received, the Secretariat then sent higher education institutions a questionnaire accompanied by the same note.

This questionnaire was designed to be comprehensive, while not requiring more than about an hour's work. It covered the basic facts and main issues; some of them as may be seen in the Annex, could themselves have which been the subject of an intensive seminar for academics researchers and school teachers. The seven main headings of the questionnaire included:

I. Title of the co-operative project
II. Duration
III. Partners involved
IV. Financing
V. Description of the project
VI. Main issues of co-operation between universities and schools
VII. Complementary information

The replies arrived between October 1990 and February 1991. Table 1 lists the 22 countries concerned, the 107 universities, and their 154 co-operative projects with primary and secondary schools (there are more projects than universities as some of them provided several). Only 17 replies could not be used for various reasons (e.g. incomplete or not relevant answers, projects not yet started). However, they all demonstrated the interest of close university/school links for teacher training in the educational use of computers in the classroom.

Table 1 does not call for any special comment since it was not the aim of the survey to collect information for a balanced comparative analysis of the various countries. The differences between the number of replies that may be observed in some cases do not of course reflect the state of progress of educational information technology in these countries. They are connected with circumstantial factors that are inevitable in this type of study. The important thing was to obtain the widest possible participation of Member countries and to assemble enough projects for a useful exchange of information, to clarify the essential problems of co-operation between the universities and schools, and to determine certain future trends.

A one-page fact sheet on each project was prepared for every reply received. This included the following data: *title of the project, person to contact, duration, funding, associated universities* and a *brief description of the project*. A preliminary analysis of these data was made in Spring 1991 for submission to the International Conference organised in May 1991 at Vilamoura, Portugal, by the Portuguese authorities and the OECD on: *New Information Technologies in Schools: Teacher Training, Research and the Role of Higher Education.*

In June 1991, all of these fact sheets were sent back to the project organisers so that they could check the accuracy of the data and especially the Secretariat's interpretation of the information given under heading V: Description of the Co-operative Project. Part two of the present report contains these fact sheets, either revised or as accepted by their authors in their original form.

Table 1. Replies to the survey

Countries	Universities	Projects
Australia	13	13
Austria	2	3
Belgium	6	12
Canada	6	8
Denmark	2	7
Finland	3	3
France	8	9
Germany	4	5
Ireland	3	4
Italy	7	8
Japan	6	6
Luxembourg	1	1
The Netherlands	5	10
New Zealand	3	5
Norway	4	9
Portugal	7	11
Spain	3	3
Sweden	5	10
Switzerland	3	3
Turkey	3	4
United Kingdom	8	15
United States	5	5
22	107	154

Chapter 2

ANALYSIS OF THE SURVEY

The basic data on the co-operative projects are analysed in Section I, and in Section II the stated positions on the main issues relating to co-operation between schools and universities.

I. BASIC DATA ON PROJECTS

The questions directly or indirectly asked in the survey are analysed below. They include: what is the specific aim of the project, who initiated it, who funds it, what is its duration, what is its link with the educational authorities, how many schools are involved and at what educational level, and who is responsible in the university (cf. Annex)?

Specific aims

The overall objective of the survey was to examine co-operative projects between university researchers and practising teachers in their classrooms, with the aim of training them of through research and, at the same time, assessing the impact of information and communication technologies on teaching and learning. Analysis of the replies (154) shows that projects have specific objectives, grouped into three categories presented in Table 2.

The first category deals with the aims of action-research projects developed jointly by the university and the school. For 24 per cent of replies, the primary aim concerns the improvement of teaching and learning mainly in subjects such as mathematics, physics or chemistry, but also in writing or languages. About half the projects concern the development of metacognitive skills, in particular problem solving and simulation. This is an interesting proportion since it is recognised that the computer is a very strong element of teaching in these areas and that these metacognitive or higher-order thinking skills are also increasingly necessary and sought after in our society. Secondly, 18 per cent of the projects aim at the development of software, either through improvement of existing packages or, in the majority of cases, by creating new ones. The replies in this category emphasize the importance of active participation by the teacher and pupils in the process of developing the project. In other words, the classroom is no longer regarded as a passive laboratory in which the university tests its prototypes.

The second category includes research projects conducted by the university in the school. These projects deal with evaluation. For the majority of the 35 per cent of the replies, the specific objective is evaluation of the educational uses of information technology in the classroom and by the pupils. A few replies refer secondarily to a macro-evaluation of a large

number of schools. This should be seen in the context of national/regional plans for introducing technologies in certain countries (see the figures in Table 7 of the number of schools involved in co-operative projects) and the request addressed to universities to conduct evaluations during their implementation.

Lastly, 23 per cent of the replies belong to a fourth category where the university will assists the school in the training of its teachers. The projects (about a quarter of replies) aim at improving teachers' computer literacy level or, in most cases, showing them how information technologies can be usefully integrated in their respective subjects (around three-quarters of the replies).

Table 2. Specific aims of the projects by categories

1. Action-research by the university and the school		
To improve teaching and learning		**24 %**
– of cognitive skills	51 %	
– of metacognitive skills	49 %	
To develop software		**18 %**
– creation	78 %	
– assessment and improvement	22 %	
2. Research in the school by the university		
To evaluate		**35 %**
– pedagogical uses of information technologies in the classroom	85 %	
– introduction on a large scale of information technologies in schools	15 %	
3. Assistance from the university to the school		
To train teachers		**23 %**
– to integrate information technologies with the curriculum	77 %	
– to enhance their technological literacy (hardware and software)	23 %	
Total		**100 %**

(calculated on the basis of 154 projects)

Initiation of project

Table 3, calculated for 141 projects (i.e. 141 replies were suitable for use, as not everyone answered this question), shows that universities (65 per cent) are the main initiators of projects, which is not surprising. On the other hand, in 13 per cent of these projects, it was the national education authorities which took the initiative, hoping to associate the universities and other higher education institutions with their national plans to introduce information technology in the schools. There is of course the case of Portugal, whose MINERVA plan now involves every university and institution of higher education, but also Dutch-speaking Belgium, the Netherlands, with its NIVO and PRINT plans and, to a lesser extent, some Australian States, Canadian Provinces, New Zealand and Turkey.

Table 3. Initiation of projects

University	65 %
School	6 %
National Authorities	13 %
Regional and Local Authorities	4 %
A joint initiative	12 %
Total	100 %

(calculated on the basis of 141 projects)

Financing

While the university is the institution which took the main initiative for starting co-operative projects (see Table 3), national educational authorities are the major additional sources of funding. This reflects these authorities' interest in training and research activities in the educational uses of information technology. Private sector enterprises are also involved in 16 per cent of the projects, as shown in Table 4, mainly providing computer hardware.

Table 4. Funding of the projects

University	41 %
School	5 %
National Authorities	68 %
Regional Authorities	12 %
Local Authorities	14 %
Private sector	16 %
Foundations	5 %
International Organisations	3 %

(calculated on the basis of 132 projects. The total percentage is greater than 100 as projects may have several sources of funding)

Duration

The analysis of 149 replies (see Table 5) reveals that most projects (45 per cent) last for 1 to 3 years, which is not always regarded as long enough by the universities involved. However, 22 per cent have a duration of 3 to 5 years, which is an interesting trend, since we know that research on the impact of technologies on the learning processes requires lengthy monitoring of the pupil cohorts concerned. It is even suggested that the Ministries of Education, which generally contribute to the funding of projects, ought to sign "6 or even 10 year" contracts with the universities. As for projects within the six months to 1 year bracket, while they constitute less than one tenth of the total, most replies to the survey deplore this short duration as it permits only 'sporadic activities'.

Table 5. Duration of the projects

6 months to 1 year	9 %
1 to 3 years	45 %
3 to 5 years	22 %
5 to 7 years	13 %
7 and more	11 %
Total	100 %

(calculated on the basis of 149 projects)

Links with educational authorities

39 per cent of the 119 useable replies to this question (see Table 6) mention close links with the national/regional education authorities. In most cases, the universities are responsible for introducing computer-based learning in pilot schools. The co-operative projects thus fit into the context of national policy to introduce computers into education, in other words either coming before (as an experiment before the more or less general introduction of computers) or after (introduction of strategies, especially teacher training, and creation of software).

Those projects with close links (39 per cent) or partial links (38 per cent) with the educational authorities, i.e. 77 per cent, should be compared with the preceding figures (see Table 4) concerning the funding of projects, where it will be seen that the national and regional education authorities make a financial contribution to 80 per cent of 132 projects.

Table 6. Links with educational authorities

Close links	39 %
Partial links	38 %
No formal links or none at all	23 %
Total	100 %

(calculated on the basis of 119 projects)

Number of schools involved

As shown in Table 7, the university usually works with a small number, on average, about 3 schools. Some projects involve many schools. This is because one or more universities are helping to introduce regional or national teacher training programmes.

Table 7. Number of schools per project

1 to 5	63 %
6 to 10	15 %
11 to 20	7 %
21 to 50	8 %
More than 50	7 %
Total	100 %

(calculated on the basis of 101 projects)

Level(s) of education

The percentages shown in Table 8 exceeds 100 since any one project may affect two educational levels, such as primary and lower secondary. Two remarks are called for. First, only 13 per cent of the projects relate to technical education. This is not a sign of the universities' lack of interest. Far from it. It is simply because researchers know that this sector differs in many important respects from general education as regards educational information technology. Its training objectives are tightly targeted and it has close links with a highly computerised working world. It is thus out of the question in technical education to have any doubts about whether or not to use computers and their peripherals. Every country has fully understood this during the past two decades. Not only is the number of machines in technical schools impressive, but they also have powerful professional software adapted for training, including office automation, CAD/CAG (computer-aided design/graphics) and CAM (computer-aided manufacture). The problems of teacher training and research are quite obviously different from those in general education. It also would be fair to say that the role of universities in training teachers is less important in vocational education than in primary and secondary general education.

The second remark concerns the relatively high proportion (84 per cent) of projects in pre-primary and primary education. This is undoubtedly a sector which deserves the special attention of researchers. Here, the aims are multiple, both as regards the learning of cognitive or metacognitive skills and socialisation. The teacher is alone responsible for initiation in several subjects. He/She can use the computer both as a tool for teaching these subjects, and also for interrelating them. The interdisciplinary approach is indeed facilitated by the use of various types of simulation software, for example in teaching ecology. Another feature of this level of education is the presence of computers in the classroom itself, which makes it easier to integrate this instrument with the other educational tools.

Table 8. Level(s) of education

Pre-primary	14 %
Primary	69 %
Lower secondary	56 %
Upper secondary	55 %
Technical	13 %

(calculated on the basis of 139 projects. The total percentage is greater than 100 as projects may affect two or more educational levels)

Faculties in charge of the projects within universities

The university researchers taking part in the project have been placed in three major institutional categories. First, they may belong to the Faculties of Education or Teacher Training Institutes. They are also found in the Research Centres specially set up for information technologies in education – even though such Centres may be attached for administrative purposes to the Faculties of Education – and, lastly, in teaching and research Faculties *other* than Education. While Table 9 below shows the preponderance of the Faculties of Education (60 per cent), it also shows that 24 per cent of the projects are carried out by these other Faculties, almost all representing the exact sciences. The major presence of computer science should be no reason for surprise in that field of information technologies in education. At the same time, this predominance of the exact sciences is also found in the Training Departments for teachers of special subjects which undertake projects in certain Faculties of Education. Thus, three-quarters of the 31 per cent of projects for which they are responsible come under Computer Science, Mathematics, Physics and Chemistry Departments.

Table 9. Responsibility for the project within the universities

Faculties or Schools of Education or Teacher Training	60 %
(*centres for educational research* 39 % *departments of curriculum development* 30 % *subject matter departments* 31 %)	
Centres or Departments for Information Technologies in Education	16 %
Faculties or Schools other than Education	24 %
(*computer science* 57 %, *mathematics* 16 %, *engineering* 16 % *sciences* 8 %, *humanities* 3 %)	
Total	100 %
(calculated on the basis of the 154 projects)	

The creation of more or less autonomous Centres for Information Technologies in Education is an interesting development. Indeed, this structure facilitates the participation of experts in the various subjects needed for research and development on the pedagogical applications of computers. It also contributes to project continuity thanks to a more stable staff and more readily available outside funding, especially from private firms and international foundations or institutions which clearly identify who makes the request; 16 per cent of the projects are run by such Centres.

II. MAIN ISSUES IN THE IMPLEMENTION OF THE PROJECTS

One of the aims of the survey was to clarify the problems experienced by the two partners in their own institution, the school or university, and in the course of their co-operation. In the school, the most sensitive problem undoubtedly concerns compensation for the extra time that teachers spend in working on the project. In the university, the question of the status of research on computer-based learning and the problem of its interdisciplinary dimension often put the brake on new developments. For both partners, the problems of communication and different expectations must be overcome.

The replies to the questionnaire on these different points were varied and there are many lessons to be learned. Rather than reducing their content to a few general consensual considerations, we have therefore preferred 'to give the floor' to the people in the field and to quote extracts from their replies (5) in order to get a better idea of their respective positions and perspectives. It can thus be apparent that the problems relating to these co-operative projects between schools and universities are universal and differ very little from one country to another.

1. COMPENSATION OF TEACHERS' TIME

It may be surmised that the success of any experimental or ad hoc innovation depends on the personal commitment of its promoters over and above their usual professional responsibilities. But this state of affairs must not be allowed to drag on as unrewarded goodwill and enthusiasm finally lose their edge. The extra time spent on innovation must therefore be compensated in one way or another. This also applies to school teachers working on educational information technology projects with university researchers. They will be faced with new theoretical and practical tasks. How can the extra time spent on these tasks be compensated?

As Table 10 shows, analysis of the replies given for 131 projects reveals three categories into which compensations for teachers may be divided. In the first, teachers receive financial compensation; in the second, they are released from some of their teaching duties; in the third, they participate in the co-operative project as part of their normal work and on a voluntary basis for the extra time involved.

Table 10. Teachers' time compensation for supplementary tasks

Teachers receive financial compensation	18 %
Teachers are released from part of their teaching duties	29 %
Teachers participate in the project as part of their normal school work and on a voluntary basis for the extra work involved	53 %
Total	100 %

(calculated on the basis of 131 projects)

Financial compensation

In 18 per cent of cases teachers obtain some financial compensation for their extra work. This comes from the special resources acquired for the projects:

"The project pays travel and subsistence. Outside term time teachers are paid fees to complete specific tasks" (College of St. Mark and St. John, Centre for Information Technology in Education, United Kingdom).

"Teachers will be paid for the time they are at meetings" (Telemark College of Education, Centre for Pedagogical Research and Development, Norway).

"The fees paid by the parents of the children participating in the enrichment courses provide teachers with some compensation for their work on the project" (St. Patrick's College, Education Department, Ireland).

"Participation was granted by a very small amount of money and participation in seminars and courses was paid separately" (University of Parma, Faculty of Sciences, Faculty of Economy, Italy).

"Teachers are paid between one and three hours a week" (State University at Groningen, Department of Physics Education, Department of Teacher Training, The Netherlands).

Or again:

"They are paid if they have been involved in producing materials" (University of Uppsala, Department of Teacher Training, Sweden).

Release from teaching duties

In 29 per cent of the replies, the teachers are released from some of their teaching duties:

"Teachers are given out-of-the-classroom release time for many project related activities, especially those required training sessions" (University of Toronto, Technology for Enhancing Learning Centre, Canada).

"In Denmark, most teachers received some compensation for the time spent on the project by a reduction in their compulsory number of lessons" (Royal Danish School of Educational Studies, Informatics in School Subjects, Denmark).

But the number of hours of release from duties varies substantially from project to project:

"They are excused 100 minutes per week, compared to other teachers, for extra studying and conducting research on this project" (Naruto University of Education, Department of School Education, Japan).

"Teachers get two hours a week release financed by the Psychopedagogic Research Centre" (University of Fribourg, Institute of Psychology and Pedagogy, Switzerland).

"Teacher researchers get 10 days release time (taken in part days) in which to conduct research in the practitioner classrooms" (University of Sussex, Institute of Continuing and Professional Education, United Kingdom).

"Secondary teachers have 4/5 hours each week free of classroom activities. However, this reduction is not enough for training, for self-training, to develop extra curricular activities and to prepare the materials to work with students" (Higher School of Education of Lisbon, Portugal).

"The teachers at the school concerned are released from their classes half-time for the project, through support made available to the National Institute of Pedagogical Research by the Ministry of Education" (University of Nancy I, Computer Science Research Centre of Nancy, France).

Naturally, replacement of these teachers is always a problem. Various solutions have been adopted. Either the school itself finds a solution with the funds obtained for the project, or the university provides replacement teachers:

"The teachers are compensated for their time spent on the project by the fact that the project pays for cover for the teachers when they are out of the classroom. This cover is paid for by giving the schools who are concerned with the project money for enhanced staffing. They therefore have flexibility about how they are going to use the money" (University of London, Institute of Education, United Kingdom).

"Teachers are compensated for time spent on the project by release teaching time from their classrooms. The University has provided qualified substitute teachers to release the teachers from their classrooms" (University of Illinois, College of Education, United States).

In certain cases, teachers use the working hours they are allowed off for continuing training:

"The in-service education is arranged during the school days. The commune pays the salary of the substitute teachers. All teachers regard the system as good and rewarding" (University of Helsinki, Department of Education, Finland).

"The work was mainly done within the teacher's timetable. Teachers at Norwegian application schools have a certain time at their disposal for developmental work. It was agreed that the extra time spent on this project was already included in the teacher's post" (Stord College of Education, Physics Department, Norway).

Normal or voluntary work

It is interesting to note – but not surprising – that in most replies (53 per cent) the extra working hours that the teacher has to spend on the project are regarded as part of his (her) "professional" commitment:

> "No time compensation or payment. Participation is expected to lead to improved instructional technology in the classroom and to contribute to the development of the teachers' skills in the use of computers for educational programs" (University of Western Australia, Centre for Research on Rural Education, Australia).
>
> "No compensation or remuneration is envisaged" (Notre-Dame de la Paix University Faculties, Department of Education and Technology, Belgium).
>
> "The project has been a part of the normal school work. Nobody was paid anything. Meetings were held after school time" (University of Lapland, Department of Education, Finland).
>
> "Participation in the project is entirely voluntary, and no remuneration, privileges or other benefits are accorded to any of those involved. Meetings are held early morning before schools begins" (University College, Dublin, Computing Services and Department of Education, Ireland).
>
> "No material compensation is possible. Everything works thanks to the 'goodwill' of the teachers who wish to take part" (University of Florence, Department of Educational Sciences, Italy).

This 'voluntary' participation in the project by 'willing' teachers nevertheless has some personal and professional compensations, as pointed out in many replies:

For example, being invited to symposia:

"The teachers were invited to the summer universities of the Commission of the European Communities to present their projects and most of them have been able to visit schools in one of the other countries" (University of Liège, Educational Technology Department, Belgium).

In almost all cases, teachers' travel expenses are paid by the project.

Participation in research publications:

"During academic year 1989-90 the teachers participated as co-authors in the compiling of a paper that was presented in a National Meeting of Science Learning" (University of Madrid, School of Education, Spain).

Obtaining university degrees or diplomas:

"With regard to our project, the teachers will have their only reward in the form of a university degree" (University of Trondheim, Department of Computing Science, Norway).

"A certificate is the only compensation" (State University of Groningen, Department of Teacher Training, The Netherlands).

Use of additional or most up-to-date hardware:

"Teachers are rewarded through access to extra hardware for the duration of the project and positive impact on teaching through personal action research" (University of Western Sydney, Macarthur, School of Education and Language Studies, Australia).

Analysis of the replies to this question indicates that the limits of voluntary work have been reached for most teachers in the area of educational information technology. Either explicitly or implicitly, teachers are asking for more time and for payment for extra work when they are not normally released from part of their classroom duties. This situation will last as long as computers are not in general use, in other words available to all pupils and fully integrated in curricula with appropriate software. Pending that more or less imminent future, suitable strategies must be found to prevent goodwill from evaporating, as was the case at the University of Maryland:

"Individual teachers who have had involvement in the project have not been compensated. One of the most critical issues relating to on-site school implementation of the Instructional Framework program is the question of teacher compensation. As this dissemination plan is developed, a particular strategy will emerge" (University of Maryland, Center for Instructional Development and Evaluation, United States).

A transitional strategy might be based on what happens in Italy, where a "national incentive fund" (very small for the moment) has been set up to facilitate teachers' activities that are not related to their usual duties:

"The teachers are not compensated for the time spent on the project; they can be paid only when carrying out particular pieces of work or when they displace themselves in order to operate as consultants for another school. However their last national contract foresees the concession of a small amount of money (from a "fondo di incentivazione") for extra teaching activities and participation in such research can be taken into account from this point of view" (University of Rome 'La Sapienza', Department of the Psychology of Development, Italy).

2. STATUS OF RESEARCH AND DEVELOPMENT

What is the status of research into the pedagogical uses of information technologies and does it bring sufficient rewards? Of what kind? This was the question posed to the universities. There are three separate situations which must be lined up with the three different structures (see Table 9) responsible for co-operative projects: Faculties of Education, Centres for Information Technologies in Education and Faculties other than Education.

Faculties of Education

The status of research is on the whole regarded as high compared with the other educational research activities:

"The area has been given research priority" (Royal Danish School of Educational Studies, Department of Foreign Languages, Denmark).

"High priority is given" (Naruto University of Education, Department of School Education, Japan).

"The status is high" (University of East Anglia, Centre for Applied Research in Education, United Kingdom).

Moreover, researchers seem to obtain a fair reward for their work, whether in terms of personal and career improvement or the production and dissemination of research findings:

"Projects connected to pedagogical use of information technology seem to have about the same status as other projects in our field – perhaps with the exception that the information technology projects have had more emphasis on development than research, in the strict meaning of the word" (Telemark College of Education, Centre for Pedagogical Research and Development, Norway).

"This is the first project in co-operation between the Department of Electrical Science and Computer Engineering and the Department of Education, and has the approval of all concerned" (Concordia University, Québec, Canada).

"All academic staff are encouraged to be involved in research. The professional rewards lie in the development of knowledge, and in our case, particularly in the interface between theory and application" (University of Central Queensland, School of Education, Australia).

"This is a high status project because of its Economic and Social Research Council funding and the very competitive bidding. In general, research of this kind has as high a status as any. Like other research, it improves the reputations of those involved and contributes to research ratings of the department" (University of Sussex, Institute of Continuing and Professional Education, United Kingdom).

"It is a high priority research area in the School of Education and has been well supported both in resources (equipment) and in facilitation terms. Rewards include recognition of my work through support and promotion" (The Queen's University of Belfast, School of Education, Northern Ireland, United Kingdom).

"Research is well accepted and acknowledged nation-wide. Also because we edited COMPASS – the series about our project – distributed widely throughout the nation with 3 000 copies" (University of Kiel, Institute for Science Education, Germany).

"Several departments have been engaged in research and development of software packages and experimental learning environments (e.g. Language, Economics, Mathematics, Geography, Education)" (Free University of Amsterdam, Centre for Geography Education, The Netherlands).

Centres for information technologies in education

Whether they depend on the Faculties of Education or are completely independent, the status of research and the recognition of research work appear to be identical to those for researchers in the Faculties of Education:

"Yes, it is a recognised field of research for tenure and promotion purposes in the Faculty of Education" (York University, Centre for the Study of Computers in Education, Canada).

"At present the status of research into the pedagogical uses of NIT in the University is equivalent to the status of other areas of research" (University of New England, Centre for Research on Information Technology in Education, Australia).

"For the past three years, the Faculty of Education has been actively rekindling its research role. The TEL Centre initiative represents major encouragement to work specifically in NIT" (University of Toronto, Technology for Enhancing Learning Centre, Canada).

Faculties other than Education

This third situation is much less positive, as demonstrated by the following positions:

"Alas, in my University such a project is not considered at all. It is even a serious obstacle to promotion (in informatics)" (University of Aix-Marseille II, University Institute of Technology, Department of Computer Science, France).

"It is low and does not bring any rewards except personal fulfillment" (Cukurova University, Department of Physics, Turkey).

"This research is neither recognised, nor organised as such. With the creation of the IUFMs – University Institutes for Teacher Training – application has been made for such recognition" (University of Nancy I, Computer Science Research Centre of Nancy, France).

"Research in the field is acknowledged, but less than theoretical research" (University of Genoa, Department of Mathematics, Italy).

"This research has no status as such and has very little prestige. The researchers in the Project give value to their work through the Artificial Intelligence component: doctoral theses, publications" (University of Paris XI, Computer Science Research Laboratory, France).

"Research into the pedagogical use of NIT occupies a low status. The attendant service required to build working relationships with the schools before teachers or administrators accept the researcher is neither valued nor rewarded. The main concern is publication of short-term action research. Schools do not benefit from this type of research but could do so if their research were of a longer term" (University of Pittsburgh, Regional Computer Resource Center, United States).

"The status is acceptable, and means have been granted for establishing a Center for computer assisted learning, but enough has not yet been done to qualify for sufficient rewards" (University of Trondheim, Department of Computing Science, Norway).

"Our University sees us as a dynamic team. But consideration may take some time" (University of Maine, Computer Science Laboratory, France).

From what has just been said, one might be tempted to draw favourable conclusions for Faculty of Education researchers and unfavourable conclusions for researchers in the other Faculties. In point of fact and in the main, it depends on the importance a particular country or university attaches to educational research and more especially to applied research in education. The following quotations amply illustrate the problem:

"The status of applied research and especially in education is lower than scientific or technological research in our university and in most universities in the country. In this sense, rewards are always insufficient. Only the papers published in journals can have some kind of value in special situations" (University of Valladolid, School of Education, Spain).

"The lack of interest of part of the education staff of the department may be explained by a difficulty in seeing the role of the new information technologies in the schools. The lack of interest of other faculty in the university may perhaps be explained by the low status of this research when compared to other fields" (Université de Lisbonne, Département de l'Education de la Faculté des Sciences, Portugal)

"The problem is far more complex than is stated in the question. At the Spanish Universities, professors of Training Colleges do not have full status of university professors even though they hold a higher academic degree (PhD). This implies a lesser professional category, less earning, more time for teaching, and less time for research. That constitutes a picture clearly different from Faculties. In this context the question is not about research on the uses of NIT, but simply on research per se. Now it seems that a shift is beginning toward more support by the University for researchers at Training Colleges. The only possible reward is to become an equal colleague to the professors of Faculties and it seems to us that this will be a medium long term reward. In the short term, I don't see any reward forthcoming, apart from personal satisfaction" (University of Madrid, School of Education, Spain)

"The Instructional Framework project is the only research or development effort in NIT that is active at the moment. Staff involved in this project are not on a tenure track, so there can be no particular academic rewards for individual participation. Professional presentations and papers relating to this research are possible depending on individual initiative" (University of Maryland, Center for Instructional Development and Evaluation, United States).

Two comments might be made in conclusion to this part of the survey on the status of research and development. The first concerns the resistance which the university seems to develop naturally towards types of research that do not fit the traditional mould of the existing disciplines, especially applied and interdisciplinary research, and still more when it comes to education. Only high-ranking academics are in a position to take them up, since they are at the top of the ladder. This explains why reputed researchers in important American universities such as Harvard, MIT, Pittsburgh or Stanford can "afford" to work, for example, with primary school teachers. Young researchers, for their part, are in a very different position since their career is ahead of them and the field is very uncertain, as pointed out by the esteemed Conservatoire National des Arts et Métiers in Paris:

"The Centre for Research and Experimentation in Teaching Mathematics has for some time been carrying out research into the use of the computer as a teaching aid in mathematics. Our work enjoys indisputably high esteem on the part of the bodies interested in this type of didactics. Even though theses on the pedagogical uses of information technologies are produced within the Centre, the benefits for those concerned are not yet tangible" (Conservatoire National des Arts et Métiers, Paris, France).

The second comment is more optimistic, in other words the situation is moving in a positive direction, as pointed out in a number of replies. Education and training have now become real priorities in the OECD countries and the educational systems are set to change considerably under pressure from the information technologies, whether as tools or subjects of

learning targets. The University of Geneva seems to have taken the measure of the challenge to be taken up on behalf of schoolchildren and students:

> "The status of this research is on the way to being recognised. Considerable resources have now been placed at the disposal of the TECFA – Training Technologies and Learning. Recognition of this research now depends on its being appreciated by the scientific community" (University of Geneva, TECFA, Faculty of Psychology and Educational Sciences, Switzerland).

3. INTERDISCIPLINARITY AND NEW EDUCATIONAL TECHNOLOGIES

Interactive educational information technologies: the mere juxtaposition of these words points to a necessarily interdisciplinary field of research. Pedagogical uses of computers require the collaboration of several disciplines ranging from education, cognitive science and developmental psychology to computer science and artificial intelligence. The university must therefore bring this interdisciplinary dimension into its co-operation with the schools. But, whether in this area of the educational uses of computers or in others, interdisciplinarity still puts a brake on careers which, for researchers, are supposed to develop in a monodisciplinary framework. This is no recent phenomenon. It has even been extensively analysed in CERI's work on interdisciplinarity (6).

The answers to this point of the survey also confirm that the problem has not always been satisfactorily solved:

> "Co-operation between researchers of different disciplines is often blocked by the rigidity of the university system, wherein each researcher is compartmentalised into his own subject area. A major obstacle to co-operation is that related pedagogical work is not taken into account for career advancement" (University of Nantes, Educational Research Centre, France).

> "It has been relatively easy to have the participation of scholars coming from education, cognitive science and developmental psychology (as well as from linguistics and psycholinguistics which were required by our particular project). We have some contact with computer science and artificial intelligence experts, but they are inserted in other types of projects. There is a strong compartmentalisation of teaching and research work in the disciplinary organisation of our university studies and it is very difficult to overcome it; also for practical reasons of physical distance and of allocation of funds. Proper interdisciplinary work is still lacking" (University of Rome 'La Sapienza', Department of the Psychology of Development, Italy).

However, encouraging initiatives should be noted, for example in the recognition of research:

> "The team involved in this project from different Universities represent scholars from education, cognitive science, developmental psychology and artificial intelligence. Within Leeds University team members participate in teaching/research studies in all the areas noted above, and there is provision for joint registration of research degrees between departments of the University" (University of Leeds, School of Education, United Kingdom).

Despite these career difficulties, all the universities stress the need for an interdisciplinary approach. They differ, on the other hand, in how this approach is or should be taken. The replies can thus be put in three main categories: interdisciplinarity: i) which is not institutionalised or is organised on an ad hoc basis; ii) implemented by a single 'general researcher'; and iii) institutionalised within the university.

Interdisciplinarity is not institutionalised or is organised on an ad hoc basis

Most replies report that this is the case. Interdisciplinarity is achieved in various ways:

Either as a result of personal initiative

"No organisation of this type exists in our University. Any initiatives are taken on a personal, and isolated, basis" (University of Santiago de Compostela, Institute of Educational Sciences, Spain).

"There is no formal organisation of interdisciplinarity in research. Yet interdisciplinary research is facilitated by interpersonal relations between researchers and the fact that the University is relatively small" (University of Klagenfurt, Institute of Mathematics, Austria).

"The interdisciplinary approach is achieved in a haphazard way by sheer personal will. The integration of multiple competences into a team remains a major administrative and structural problem in France" (University of Maine, Computer Science Laboratory, France).

"Within our School, as an educational psychologist, I hold frequent informal discussions with my professional colleagues in Computing Education, Science, and Language Arts. As a small School, such discussions are constant and easily arranged" (University of Central Queensland, School of Education, Australia).

"Nothing organised. This approach therefore rests on the initiative of researchers who meet regularly, including in the field with the teachers who apply the software" (University of Aix-Marseille II, University Institute of Technology, Department of Computer Science, France).

"All these groups exist at Sussex with education and artificial intelligence being particularly strong. There are links between the groups at the personal level and some attendance at each others' seminars" (University of Sussex, Institute of Continuing and Professional Education, United Kingdom).

Or 'naturally'

"Within the Education Faculty, NIT teaching /research 'somewhat spontaneously' brings together diverse skills/abilities. Interdisciplinary work is not planned for at the institutional level" (Massey University, Educational Research and Development Centre, New Zealand).

"As has been described, the project involves researchers from several areas. In some of the research activities there is fruitful co-operation between them, trying to complement individual competences. The collaboration is done quite naturally, in a rather informal way" (University of Coimbra, Department of Electrical and Computer Engineering, Faculty of Psychology and Educational Sciences, Portugal).

Or on an ad hoc basis

"As current research is being undertaken in the School of Education, a wide range of interdisciplinary expertise exists within the school. Other expertise is sought when necessary" (University of Western Sydney, Macarthur, School of Education and Language Studies, Australia).

"The interdisciplinary approach is achieved thanks to co-operation between researchers from the Department of Education – educational sciences, and cognitive sciences, and from the Department of Electrical and Computer Engineering – informatics and artificial intelligence" (Concordia University, Québec, Canada).

"At present, the interdisciplinary approach is not organised formally, but some co-operation does take place between departments of different disciplines" (Royal Danish School of Educational Studies, Institute of Informatics, Denmark).

"There is no formal organisational structure established for this work. A number of cross-disciplinary project teams have been established to advance particular projects" (Monash University, Faculty of Education, Australia).

"A special project group is established for each project. The project grant is used to buy the group members free (completely or part-time) from their regular positions" (Telemark College of Education, Centre for Pedagogical Research and Development, Norway).

This last reply implies that, with substantial funding, researchers could be obtained from various disciplines. The problem is finding this financial support, as pointed out by the University of Jyvaskyla:

"The problem is not an organising an interdisciplinary approach, but, rather, to formulate fruitful research problems to get enough financial support to build an interdisciplinary project, which takes easily several years" (University of Jyvaskyla, Institute for Educational Research, Finland).

Interdisciplinarity is achieved by a 'general researcher'

This second category reveals an interesting tendency relating to a basic issue concerning interdisciplinarity. Some researchers are already or will become 'general practitioners' of educational information technology. As in medicine, these general practitioners will have skills in various fields and are supposed to be fully conversant with their interrelationship. This position is only possible if the research does not call for a very specialised level of knowledge. Two situations may be distinguished:

Either the researchers are already general practitioners

"I can consult with all these different disciplines by lifting a telephone. I also have an interdisciplinary background, education, cognitive science, developmental psychology and artificial intelligence" (University of Exeter, School of Education, United Kingdom).

"There is sufficient competence within the Computing Science Department itself in the areas of computer science, cognitive science, and artificial intelligence, often united in one person" (U iversity of Uppsala, Computing Science Department, Sweden)

Or they must become general practitioners

"The university is just beginning to plan such attempts. In the Project described above the researcher has tried to become familiar with all the important sectors of the field" (University of Helsinki, Department of Education, Finland).

"A researcher has to acquire a multitude of competences: cognitive psychology, education, information technology, artificial intelligence and programming (e.g. LISP or PROLOG or PASCAL, experimental research, English). This is because the different specialists (computer scientists, linguists, engineers) tend to leave the research teams for more lucrative posts" (University of Liège, Educational Technology Service, Belgium).

Interdisciplinarity is institutionalised within the university

This is the third category. Such institutionalisation certainly facilitates the interdisciplinary approach.

It can take the form of a Committee:

"The interdisciplinary approach is essentially organised through a Computer Policy Committee at the University that oversees all computer policy across the subject areas. Additionally some members of academic staff have a particular job specification which relates to introducing computers across the curriculum" (University of London, Institute of Education, United Kingdom).

Or, more generally, a Centre specially set up to study the impact of information technologies on teaching and learning:

"The Centre for the Study of Computers in Education has been established for the purpose of bringing together multidisciplinary teams to carry out research with schools, government and industry" (York University, Centre for the Study of Computers in Education, Canada).

"The University has established a Centre for Computer Based Learning, created as a joint venture between the Computer Centre and School of Education. A wide variety of projects has been undertaken within the University, involving psychologists, educationalists and computer scientists as well as many subject matter experts" (The Queen's University of Belfast, School of Education, Northern Ireland, United Kingdom).

"Within the Faculty of Education, the Technology for Enhancing Learning Centre is acting as a communications hub for Departments which are developing interests in NIT. The Centre is also just beginning to serve a similar role for other University departments and faculties. The Centre sees facilitating connections within the Faculty of Education, within the University and with external partners as part of its mandate" (University of Toronto, Technology for Enhancing Learning Centre, Canada).

We referred earlier (see para. 40) to the tendency to set up such centres. Although such a structure seems the best for developing interdisciplinarity, its results are not yet convincing:

"We have at the University of Trondheim a Centre for Computer Assisted Learning, which encourages an interdisciplinary approach, with some success. This centre started in 1985 and is still of modest dimensions, but of a respected quality" (University of Trondheim, Department of Computing Science, Norway).

"The project has through the Centre for Computers in Education been involved in day-to-day problems of introducing NIT in teachers' pre-service and in-service training and out in schools. The Centre could however be the basis for interdisciplinary work in this field but up till now very little co-operation of this kind exists at this university" (University of Umea, Department of Teacher Training, Sweden).

Interdisciplinarity is either the product of certain researchers' personal curiosity or their friendship with other researchers or of the endogenous development of the demands of scientific knowledge (artificial intelligence and cognitive psychology). But interdisciplinarity can be very concrete or precise when it comes from outside the university, in other words when it corresponds to the actual complexity or "multi-referential" nature of any real problem. In the present case, the question is how the pupil learns and what he learns when working interactively with a computer.

This pressure brought to bear by communities, through their increasing demand for help in analysing and solving their problems, might oblige the university to thoroughly overhaul its curricula and research programmes and institutional structures. As was pointed out in an earlier CERI publication, "Communities have problems... Universities have departments" (4), and this idea of problem-oriented instead of discipline-oriented university structures seems to be making headway, and in computer-based education too. The reply from Griffith University provides a good example:

"Since its inception, one of the fundamental goals of Griffith University has been to organise its research and teaching in an interdisciplinary and problem-oriented manner. In keeping with this aim each of the major academic units (divisions) of the University is concerned with a particular set of problems and themes of importance to the community at large. As a consequence, each of these units is expected to provide the appropriate disciplinary resources in terms of staff and equipment so that all aspects of the problems may be addressed" (Griffith University, Division of Education, Australia).

But even without such a helpful organisation, the university is naturally inclined to interdisciplinarity when it becomes really involved in a community problem, as demonstrated by the replies quoted above to the question concerned. Once again, the experience gained by Portugal from its MINERVA national plan is full of lessons and offers an optimistic conclusion in this connection:

"The central role played by universities and teacher training colleges during the pilot phase had some singular consequences. One was the creation of a high degree of cross-disciplinarity, with mixed teams of university staff with quite different backgrounds (natural scientists, physicists, mathematicians, historians, psychologists, computer scientists, and many others), teacher college staff, and school teachers getting together to:

- develop collaborative projects, often including considerable components of research;
- engage in joint educational software and materials development projects; and
- team up in teacher training specially when teacher training was used as the basis for joint development of educational software, or for carrying out research projects where the participation of teachers and pupils was essential" (7).

4. COMMUNICATION BETWEEN RESEARCHERS AND TEACHERS

The difficulties experienced by teachers in the school and researchers in the university are compounded by their difficulty in communicating and hence co-operating with each other. This question of the survey, adapted to a number of specific situations, could in fact apply to every case of partnership when there is a difference between the partners. But it is precisely this difference which is both a source of problems and a source of enrichment. The two greatest difficulties are, on one hand, the expectations, and on the other, the different competences of both parties.

Different expectations

Put in a simple way, these difficulties result from the different aims and methods of working of the two partners. The teacher requires that pupils learn in the best possible way what has been designed in their own subject matter and does not necessarily feel concerned by the methodologies of research; the researcher, for his part, works to increases his comprehension of the process of learning and does not face the pedagogical responsibilities of the teacher.

> "The anticipated end product was not viewed in the same way by both partners. In particular, the teachers wanted to develop CAI type applications (tutorials), while the researchers proposed the use of more open-ended applications. The expectations of both sides had to be made clear, and subsequent negotiation was necessary" (Notre-Dame de la Paix University Faculties, Department of Education and Technology, Belgium).

> "The major problem which has occurred between researchers and teachers is the difference in expectation of what would be happening and also the length of the developmental period. Teachers tended to view the situation as one where there would be very little developmental time, whereas the researchers saw that as the major time constraint. The second problem of communication concerned the evaluation phase of the project. The researchers had a more rigorous approach to evaluation than the teachers. The teachers expected that evaluation could more easily occur at the classroom level, whereas the researchers wanted more quantitative material" (University of Western Australia, Centre for Research on Rural Education, Australia).

> "There are sometimes problems of communication/expectations between the researchers and teachers. For instance, teachers are often less interested and sometimes bothered by the request of collecting 'good' and reliable data of children's performance, of having accurate observations, of keeping track of the teaching activities and so on. There can also be problems due to a different conception of what is learning and teaching, or different evaluations of different types of competences in children: autonomy of judgement versus 'correct' answers, planning or explaining versus remembering or repeating, and so on. In particular, for some teachers it is still difficult to accept the idea that the computer can be a mediational tool for a lot of different activities carried out by children rather autonomously, and that the computer does not necessarily require a specific allocation of time in the school day or week – such as the 'computer hour'!" (University of Rome 'La Sapienza', Department of the Psychology of Development, Italy).

But complementary skills

The competences of teachers and researchers in the pedagogical applications of information technologies are, of course, very different, but they are above all complementary. The difficulty lies in putting their own knowledge in the perspective of the project which links them and in exchanging their skills and experiences:

> "At the beginning, since the teachers had little experience on microcomputers and most of the researchers had little experience in instruction, some communication problems appeared. But after holding seminars and meetings, we tried to solve the problems" (Middle East Technical University, Faculty of Education, Turkey).

> "Co-operation between researchers very advanced in informatics and primary teachers more concerned for the effectiveness of their teaching – in this case, reading – obviously poses problems. On the one hand, there are problems of communication: the computer scientists are too much at ease with their own vocabulary and their technical competence. On the other, there are different expectations: the researchers want to advance quickly, while the teachers want to absorb the NITs without too much disturbance of their traditional methods" (University of Aix-Marseille II, University Institute of Technology, Department of Computer Science, France).

> "One problem is that people know too little about others' subjects and disciplines. The teachers lack experience with computers, and the computer scientists have too little knowledge of the different disciplines and are not always addressing questions of a pedagogical nature" (Telemark College of Education, Art and Crafts Section, Norway).

> "The one problem which has always haunted technology remains the enthusiasm of the technologist for the technology which often makes him/her deaf to pedagogical and management concerns raised by front-line teachers" (University of Calgary, Department of Curriculum and Instruction, Canada).

Certain replies suggest that one way of relieving the difficulties would be better training for teachers:

> "Yes, there are problems of communications/expectations, but they mainly arise from the lack of time for the teachers to study and prepare new paradigms on what the researchers' group want to pursue" (Naruto University of Education, Department of School Education, Japan).

> "Generally the skills levels of teachers are lower than what is expected. Their enthusiasm, however, compensates greatly for this and they quickly acquire the necessary skills" (University of Limerick, College of Education, Ireland).

The University of Coimbra, Portugal, provides extensive initial teacher training:

> "Teachers who work with the university team have a considerable training time in their first 6 months in the project. This fact, and also the close relation between both teams, minimises the problem" (University of Coimbra, Department of Electrical and Computer Engineering, Faculty of Psychology and Educational Sciences, Portugal).

It might be thought from the preceding discussion that communication problems will die out in future when teachers are more skilled in the educational uses of computers, and researchers are more aware of the educational reality of the classroom. This would be a stage where the researcher's theoretical knowledge is in part relativised, while the teacher's empirical knowledge is upgraded.

Of course in a partnership situation, there will always be personal difficulties, as aptly observed in this reply:

> "Communication problems always exist. It is felt, however, that, overall, the relationship is quite friendly and productive to both sides" (University of Lisbon, Faculty of Sciences, Department of Education, Portugal).

III. IMPROVEMENT IN CO-OPERATION BETWEEN PARTNERS

The preceding analysis of the difficulties experienced by the schools and universities in carrying out joint projects should not be viewed too pessimistically; far from it. As for any innovation, it takes time to persuade institutions to change their mentality and often their methods of work. The replies to the above question clearly reveal some points and suggestions which ought to be considered by both partners and by their respective institutions, not forgetting action by the national education authorities. The positions are therefore discussed at four levels: the two partners, the school, the university and the educational authorities.

At the level of the two partners

The improvement of co-operation might be based on:

An increased "clear" and "very honest" communication between teachers and researchers

The following replies illustrate this need:

> "Communications is a vital element of collaboration projects. All participants have carefully worked to increase communications. There were times unclear expectations contributed to misunderstandings. The continued establishment of trust among all participants of the project will enhance the collaboration" (University of Illinois, College of Education, United States).

> "It is necessary to have all participants (teachers, administrators and researchers) understand that they have common interests" (University of Helsinki, Department of Education, Finland).

> "More meetings to discuss ideas and views could enhance mutual understanding of key issues" (State University of Ghent, Educational Information Sciences, Belgium).

A mutual recognition of knowledge and functions

In fact, good communication can only be established if the two partners feel that they are on an equal footing, with skills that are of course different but complementary. As emphasised by the University of Valladolid:

> "Put at the same level: values, knowledge and recognition of functions of teachers and university lecturers" (University of Valladolid, School of Education, Spain).

> "Greater recognition within universities and higher education of the value of teachers' professional knowledge, including accreditation for on-the-job research and developmental activities" (University of East Anglia, Centre for Applied Research in Education, United Kingdom).

The Educational Technology Center at Harvard University in the United States has since 1983 acquired solid experience of co-operation with schools. Five years later, it described in a publication (8) one of the main hindrances to co-operation: "Despite overlapping interests, the relationships between schools and universities have often been fraught with misunderstanding and disappointment. As a result, doing collaborative research requires not merely building bridges where few exist, but also helping people from two different cultures to understand each other's goals, develop a shared language, and work together to see that both research and practice are improved when the two are closely connected.".

The experience at London University of this last aspect is particularly revealing:

"We have been very pleased with the communication channels between teachers and researchers. It is undoubtedly true that the teachers and researchers do have different skills and indeed agendas but we have managed to have very fruitful discussion. I think the key to the success of our communication has been that we both gain from the collaboration – the teachers gain by receiving our advice and help and indeed receiving our curriculum development materials which they are very happy (indeed desperate) to try, given the scarcity of good materials for introducing computer work into classrooms; we certainly gain by having sites in which to do our research and indeed by getting feedback from the teachers on the effectiveness of our work" (University of London, Institute of Education, United Kingdom).

Good preliminary planning

"By a more sensitive and systematic addressing of teacher concerns, as the key to successful innovation adoption and with well planned professional development, on-site, on an as-needs basis and through collaborative planning and consensus as to what is required" (Massey University, Educational Research and Development Centre, New Zealand).

"Convene and meet with teacher inquiry teams to identify areas of research and necessary supportive activity within district and School of Education environments; convene and facilitate potential faculty and student researchers to work as School of Education team members or independent researchers within the district; and convene an evaluation team for assessing the impact of consortium activity and to suggest modifications in implementation" (University of Pittsburgh, Regional Computer Resource Center, United States).

The assistance of a third institution might facilitate this preliminary planning:

"In this project there has been, so to say, a structural, in-built solution to the communication problems with teachers: in addition to the teachers and researchers, there are other persons and bodies involved too, and it has helped a lot. For example, the various proposals were not made by the researchers and given to the teachers, but negotiated with the Kauniainen town New Information Technologies Development Board. Of course, there were problems, but problems that had to be worked through, not to be looked at only" (University of Jyvaskyla, Institute for Educational Research, Finland).

This type of structure is frequently found in the United States:

"I think that one way would be to use a Centre for Computers in Education more intensively and give it more resources. We already arrange seminars in the use of computers in the teaching of different subjects (e.g. languages or maths) to which both teachers from the university and the schools are being invited. However, up till now no seminars have been presented to those doing research in this field. The activities of such a Centre then must be directed by a steering group of people involved both in research and subject teaching at different levels in this field" (University of Umea, Department of Teacher Training, Sweden).

Use of electronic networks to communicate

This is a practical way of facilitating exchanges since it avoids a certain amount of travel for researchers and teachers:

"The provision of a computer network service whereby teachers and researchers involved in the project could communicate by e-mail and obtain remote access to a bulletin board and an information base of resources used in or arising from the project" (St. Patrick's College, Education Department, Ireland).

"Computer conferences with a personal computers network would be one possibility to improve the situation" (Joetsu University of Education, Centre for Educational Research and Development, Japan).

Lastly, there is a broad consensus on the need for more resources

"Financial constraints were (and are) a constant irritant when exploring new fields" (University of Central Queensland, School of Education, Australia)

"More financial support to organise face-to-face meetings at all levels: researchers, teachers, students" (Royal Danish School of Educational Studies, Informatics in School Subjects, Denmark)

"Better financing, in particular to have a range of experimental machines" (University of Paris XI, Computer Science Research Laboratory, France).

"To have more material resources, so as to widen the range of experiments and to improve teacher training" (University of Santiago de Compostela, Institute of Educational Sciences, Spain).

"Co-operation could be improved by more money so that we can give more time for teachers to be allowed out of the classroom, more hardware so they can have a computer at home" (University of London, Institute of Education, United Kingdom).

"Money for release time of teachers" (Arizona State University, Technology Based Learning and Research, United States).

"Co-operative research programs need resource allocations which allow them the very latest computer resources and instructional design technologies. Resource allocations

need to be large enough to fund not only the resources required by research personnel, but also the resources needed to install such technology in school based test sites. Funds for staff training are essential for such programs to be successful. Without such resources, the time lag between technological development and practical implementation is too great for synchronous and truly co-operative efforts between university and school personnel to become a reality" (University of Newcastle, Special Education Centre, Australia).

The University of Jyvaskyla in Finland demonstrates the issues involved when there are not enough resources for increasing the co-operation with schools:

"There are less and less free researchers just waiting for the opening of co-operation with schools. In Finland, the schools and communities use more or less all their resources in teaching and only little is left for developmental work. Central governing bodies, on the other hand, have to allocate most of their scarce resources to administering the development. Seen from the point of view of a research institution, it is not easy to bring together schools that are ready for some brave innovations with the economic resources of the funding agencies" (University of Jyvaskyla, Institute for Educational Research, Finland).

At the school level

Some measures and attitudes to improve co-operation lie with the schools and the supervisory authorities. What is needed are: .

More release time and better financial compensation for teachers

"Give teachers more time to study and review what they achieved from past discussions" (Naruto University of Education, Department of School Education, Japan).

"By better wage compensation or time reduction for teachers" (Royal Danish School of Educational Studies, Department of Danish Language and Literature, Denmark).

"...One example is that computers with modems offer some teachers networking ability, but the teachers will ask: 'When do I have the time to network?' And the answer is they do not, not during the school day" (Columbia University, Teachers College, United States).

A greater recognition of the pedagogical competence of teachers

"Dependence on the 'expert' should be avoided. In many aspects, concerning for instance children managing skills, teachers are the real experts and should be evaluated as such" (University of Rome 'La Sapienza', Department of the Psychology of Development, Italy).

And of the value of their action-research in classrooms :

"To enhance the value of the research function in the school, by giving teachers time for reflection and to recognise its benefits" (Notre-Dame de la Paix University Faculties, Department of Education and Technology, Belgium).

At the university level

Three main measures to facilitate co-operation more especially concern the universities: *The recognition of the value of the co-operative project and support from senior university authorities*

"By more focused and effective support from the university authorities and academics; by increased schools staff, observers who can relieve the teachers of certain tasks and allow the addition of an evaluative element to the quantitative element already practised; by logistical support so that precious and accountable time is not lost in practical tasks" (University of Paris-Nord, Department of Educational Sciences, France).

"Co-operation would have been improved if the University, as an institution, had formally acknowledged the involvement and the work undertaken in the project as part of the duties of the professors involved. Not having received this official recognition, the professors were forced to carry out their involvement over and above their full-time work assignments at the University. In consequence, a great deal had to be done outside normal working hours, so as to fulfill the obligations laid down by the Ministry within the parameters of the project. Day by day follow-up of the project by the professors was therefore not possible, even though it would have been desirable and mutually enriching" (Laurentian University, School of Education, Canada).

A selection of researchers able to work with teachers

For there are special skills and attitudes for good co-operation: .

"C. fully picking research team members on not only their subject expertise but on their ability to relate to teachers" (York University, Centre for the Study of Computers in Education, Canada).

"In research with the primary schools, the experience (of long duration) of the researchers made it possible for them to adopt good strategy from the beginning: to let teachers make their own decisions and follow their own rhythm (as the people who will have to take the consequences!). The results are unbelievable: after only one year, pupils of 10-11 years in Belgium are able to: operate software, manage a database system and a word processing, almost without realising it, because these applications are integrated into their existing normal activities" (University of Liège, Educational Technology Department, Belgium).

Research should have the same status as fundamental and technological research

The following proposals are suggested in response to the complaints made by some Faculties about the status of research on computer-based education (see paras 58-59). Indeed, it is necessary to:

"Facilitate action-research in the University and accord it equal status with technological research" (Notre-Dame de la Paix University Faculties, Department of Education and Technology, Belgium).

"Facilitate the integration (status, careers) of different profiles. Pluridisciplinarity should be held up as an example, and the researchers should not be 'bullied' – e.g. recognition of the value of multidisciplinarity work by the examination boards of theses" (University of Maine, Computer Science Laboratory, France).

"Allow the formation of 'interdisciplinary teams' (still rare and difficult in France); give 'temporary researcher status' to teaching personnel involved in the work; make these themes a recognised research priority for the universities to train teachers effectively" (University of Nancy I, Computer Science Research Centre of Nancy, France).

Some replies show that those involved think that the best way of meeting these demands would be to set up Information Technology Centres, and, as we have seen (see para 40), a marked effort has been made in this direction. Co-operation in this university in Portugal, a country which already has wide experience, would be strengthened:

"By the existence, within the University of Oporto, of an authentic pluridisciplinary centre for informatics and educational technologies, which could be directly responsible to the Rector of the University" (University of Oporto, MINERVA Node Department, Portugal).

At the level of national/regional educational authorities

Scientific recognition of the value of co-operative projects is required and hence greater financial participation by the educational authorities. Communication would be improved:

"If more time were made available, perhaps by funding human resources for a limited period to complete the prototyping work of the project. This would require recognition from the national education authorities" (University College, Dublin, Computing Services and Department of Education, Ireland).

"By increased funding and a policy which appreciates and rewards this kind of research and co-operative work" (Cukurova University, Department of Physics, Turkey)

But if the national authorities provide most of the financial backing for the project, they are entitled to see that the aims of co-operation are maintained, as stressed in this reply:

"Close co-operation between university researchers and teachers is one of the principal demands of the supporting organisation – the Ministry of Higher Education and Science – and is strongly encouraged. If necessary, this body takes such measures as are necessary to improve co-operation by allowing the teachers involved in the project to be directly compensated" (Concordia University, Québec, Canada)

To conclude this part of the survey, the optimism or realism of several replies must be noted. This is a new field of educational research and experiment where close co-operation is desired between two partners who know very little about each other. It needs patience, but we can fully endorse this comment:

"Co-operation will improve with time, through frequent meetings, dialogue, joint work between the partners" (University of Aix-Marseille II, University Institute of Technology, Department of Computer Science, France).

IV. AN INCREASING ROLE FOR UNIVERSITIES

"More generally, what are your views on the role that Universities should play in helping schools successfully to introduce information technologies?" This question was put in the spirit of the conclusions of earlier OECD work (4) on the role and, we might venture to add, the *responsibility* of the university for the economic, social and cultural development of its local and regional environment. This not only means adding a 'service' function to the traditional university functions of education and research, but establishing the necessary feedback between the theoretical knowledge built up by the university and the community's empirical knowledge, or, further simplifying it, relativising the first and upgrading the second. While university/industry relations already have a long and rich history, this is not the case for relations between the universities and primary and general secondary schools (it goes without saying, on the other hand, that technical education has always had links with the working world).

The introduction of information technologies in general education raises many complex problems which concern both what the pupils have to learn, how and where. The teachers cannot alone provide the answers. The universities have the means to help and, in some cases, the desire to and are quite aware of the advantages for themselves.

But this desire is not enough:

> "The thesis seems reasonable, that universities should take the lead in introducing the tools of technologies for education in the schools. The history of such co-operation, at least in this part of the US, is discouraging. Universities rarely contain faculty members who are both close enough to classrooms, and sufficiently knowledgeable about the technologies, to offer wisdom to the schools. In addition, there is little reward for faculty members to spend their time in this way, as it usually does not lead to research articles of the kind that earn promotion and tenure. School staff for their part often feel faculty lack classroom experience and are not practical, especially about the time pressures faced by most classroom teachers" (Columbia University, Teachers College, United States).

> "Universities can play a vital and important role, because co-operative development in schools is crucial at this stage in the introduction of NIT; so little is known about how best to use NIT in schools. However, not many Universities have staff with the requisite skills; and normally there is no funding for this kind of work" (University of Sussex, Institute of Continuing and Professional Education, United Kingdom).

or again:

> "We support fully the sentiments expressed in your position paper accompanying this questionnaire. The university does have resources and expertise and should consider NIT in schools. But in difficult economic times, the generally low priority given to education and to educational research compounds the difficulties confronted by educational researchers" (University of Otago, Department of Education, New Zealand).

In spite of these difficulties, which have been amply stressed in earlier sections, the replies to the questionnaire all express the university's commitment to help the schools to realise the potential of information technologies in teaching and learning. The universities first stress their role of providing *assistance* or *support* for the schools:

"A supporting role in: the training of teachers; the design of the uses of NIT; the selection of hardware and software; the facilitating of communications between teachers, e.g. periodicals, meetings" (University of Liège, Educational Technology Department, Belgium).

"Pedagogical support in methodologies: research, evaluation and project enrichment; management of innovation" (University of Minho, School of Engineering, Portugal).

"Latest information concerning research and development will be offered at the expense of the University; through the electronic mail system, database services will be one of the key elements; publication of a newsletter; publication of research outcomes" (Joetsu University of Education, Centre for Educational Research and Development, Japan).

Apart from *assistance*, the replies stress the necessary *co-operation* with the schools:

"The University is definitively the key element in developing information technology, but it needs to work with schools to perfect developments" (Arizona State University, Technology Based Learning and Research, United States).

"We reckon the effect of this project will be rather limited, but it has shown us a way to proceed on a larger scale. Co-operation between higher education, teacher training and schools is vital in the future development of this area" (Stord College of Education, Music Department, Norway).

"Universities can certainly assist schools a great deal through the provision of research material, training resources and actually generating co-operative research programs which provide schools with contemporary technological involvement. Universities should probably be involved in each of these areas: provision of human, hardware and software resources through co-operative research programs, provision of training services, and provision of actual educational program resources" (University of Newcastle, Special Education Centre, Australia).

Several universities go further and emphasise the survey's initial assumption that research on the educational uses of technologies is impossible without the help of teachers in the classroom and that teachers learn at the same time from this action-research:

"Not only co-operation with the teachers, but being present in their classrooms and engaging them in research activity which then becomes autonomous" (University of Fribourg, Institute of Psychology and Pedagogy, Switzerland).

"Working collaboratively with and alongside practitioners in both university and (as much as possible) school settings, designing, implementing and evaluating curricula, explaining/demonstrating how NIT can be made to work effectively to enhance teaching and learning; acting as consultants/co-planners and as formative evaluators; acknowledging and respecting the abilities, knowledge and experience of teachers and seeking to demonstrate benefits through participatory research, rather than by top-down methods" (Massey University, Educational Research and Development Centre, New Zealand).

"Universities must support teachers through technology-based initiatives in degree programs and in direct intervention in the schools themselves. The research in education technology being done in higher education cannot remain isolated to the campuses themselves, but must filter down to the students and teachers in primary and secondary schools (K-12 levels) who need this support and training the most. Research for research's sake is self-defeating; applied programs and models are more productive and useful for education as a whole" (University of Maryland, Center for Instructional Development and Evaluation, United States).

This *co-operation* is regarded as particularly necessary for 'pilot projects' or 'research and development projects', which most countries agree are the essential first stage for the general introduction of information technologies in schools:

"It is essential that pilot projects are carried out before new ways of using information technology are introduced. To be most useful, they should allow teachers, school administrators and children to articulate their needs and what they find acceptable. Universities and other higher education institutions doing pre-service and in-service teacher training have the expertise and the material resources to initiate the pilot projects and to study systematically the outcomes"(Royal Danish School of Educational Studies, Institute of Informatics, Denmark).

The Universities can play two important roles: use information technology in their own teacher education to make the teachers aware of some of the educational potential of new technology; co-operate with schools and school teachers in research or development projects using information technology for educational purposes" (Telemark College of Education, Centre for Pedagogical Research and Development, Norway).

The strong point of this co-operation in pilot projects lies in the creation of knowledge through action-research and its dissemination through the basic and continuing training proposed by the universities and other higher education institutions:

"It is essential that the Royal Danish School takes a leading part in the introduction and evaluation of new ways of using new information technology in school. This ensures that the experiences from pilot projects are obtained in a consistent and well documented form, usable for other teachers and for the educational planners. Furthermore, if the projects are collaborative, the results can immediately become part of subject matter taught in the in-service teacher training courses at the Royal Danish School" (another Project from Royal Danish School of Educational Studies, Institute of Informatics, Denmark).

"The universities must carry out their research activities with full interaction in the field, so as to develop knowledge and disseminate the results of the research in the initial (most important) and continuous training of teachers for which they are responsible" (University of Nancy I, Computer Science Research Centre of Nancy, France).

"More or less as a result of our research, we are able to organise highly profitable courses for the training of teachers in these new fields, including physics teachers and teacher trainees" (State University at Groningen, Department of Physics Education and Department of Teacher Training, The Netherlands).

Throughout the preceding, it is assumed that the university is the essential institution for co-operation with the schools. There are of course other partners, especially computer manufacturers. But the question is whether the latter have the necessary human resources to find out how computers and the associated technologies can improve the teaching and learning processes. On the other hand, they have played a very influential role through the provision of hardware, both under national supply programmes and through direct assistance for schools. In several countries, they have also *initiated* teachers to information technologies, i.e. to teaching the basic principles of computer operation, both for hardware and software. Their financial contribution to pilot projects is still very useful -- particularly in the initial stages of national programmes -- but it is the educational sector's responsibility to study the educational uses of computers, as observed in this reply:

> "When the national strategy to introduce new information technologies in schools involves computer companies for conducting pilot projects, what you end up with is some BASIC programming instruction and courseware which mainly consists of electronic textbooks and drill and practice. However, the present trend in the world is away from BASIC, towards the use of content free application tools like word processors, spreadsheets, graphics packages etc. and towards development of creativity and problem-solving skills" (Cukurova University, Department of Physics, Turkey).

In some countries, the local/regional education authorities are the essential partners of the schools, but it is nonetheless the university which should have the main responsibility for helping to introduce successfully the most dynamic pedagogical innovation over the last few decades. The reply from the University of London, which will also conclude this analysis of the survey, is eloquent in this connection:

> "My view is that Universities should play a central role in helping schools successfully to introduce information technologies. This obviously should be done in partnership with schools and in our case local education authorities. In a field such as information technology where the hardware and the software is changing rapidly, universities have a role in that development, but also in relation to the school system in terms of gearing the development so that it can be implemented in schools and also finding ways in which the technologies can be specifically geared to epistemological issues and with the learning of specific subject matter" (University of London, Institute of Education, United Kingdom).

Notes

(1) OECD/CERI (1986), *New Information Technologies: A Challenge for Education*, Paris.

OECD/CERI (1987), *Information Technologies and Basic Learning: Reading, Writing, Science and Mathematics*, Paris.

OECD/CERI/SED (1988), *Microcomputers and Secondary Teaching: Implications for Teacher Education*, ed. by the Scottish Education Department, Glasgow, United Kingdom.

OECD/CERI (1989), *Information Technologies in Education: The Quest for Quality Software*, Paris.

(2) For example:

Deakin Institute for Studies in Education (1987), "Coming to Terms with Computers in Schools". Report of the Schools Studies of the National Evaluation Study of the Commonwealth Schools Commission's National Computer Education Program, Australia.

England and Wales, Department of Education and Science (1987), *Aspects of the Work of the Microelectronics Education Programme, Report by HM Inspectors*, HMSO, London, United Kingdom.

Ministère de l'Education Nationale, de la Jeunesse et des Sports (1989), L'informatique à l'école : L'expérience française. Direction des Écoles, Paris, France.

Scottish Education Department (1987), *Learning and Teaching in Scottish Secondary Schools: The Use of Microcomputers, HMSO*, Edinburgh, United Kingdom.

OECD/CERI (1987), "The Introduction of Computers in Schools: The Norwegian Experience", Examiners' Report, Paris.

OECD/CERI (1991), "Projecto Atenea, Evaluators' Report", Ministerio de Educación y Ciencia, Madrid.

OTA (1988), "Power On! New Tools for Teaching and Learning", Congress of the United States Office of Technology Assessment, United States.

OTA (1989), Linking for Learning: A New Course for Education", Congress of the United States Office of Technology Assessment, United States.

(3) OECD/CERI (forthcoming 1992), *Teacher Training*, Paris.

(4) OECD/CERI (1982), *The University and The Community - The Problems of Changing Relationships*, Paris.

(5) In June 1991 a letter was addressed to all respondents to the Questionnaire together with the draft fact sheets for corrections. It was stressed that the OECD analysis "will take into account not only the information provided under I to V, but also the answers, more subjective, which have been collected under Part VI of the Questionnaire".

(6) OECD/CERI (1972), *Interdisciplinarity - Problems of Teaching and Research in Universities*, Paris.

(7) MINERVA (1991), "Experiences and Prospects"; Paper presented at the Vilamoura International Conference, May.

(8) Educational Technology Center, Harvard Graduate School of Education (1988), "Making Sense of the Future". A position Paper on the Role of Technology in Science, Mathematics, and Computing Education, January.

Annex

QUESTIONNAIRE

I. Title of the Co-operative Project

II. Duration of the Co-operative Project

III. Partners Involved

1. *The University(ies)*

   1.1 Name(s) of the University(ies) or Higher Education Institution(s)

   1.2 Name(s) of the Centre, Faculty, Department, School, Institute or Laboratory conducting the research

   1.3 Address(es)

   1.4 Name(s), background and position(s) of researcher(s) involved

2. *The School(s)*

   2.1 Name(s) and main location of the school(s)

   2.2 Level of education (i.e. pre-primary, primary, lower secondary, upper secondary, vocational)

   2.3 Subject area(s) of teachers involved

3. *Other(s) body(ies) involved in the Project* (e.g. National/regional or local educational authorities, public and private research institutions, Enterprises)

   3.1 Name(s) and main location

IV. Financing of the Co-operative Project (including equipment, if applicable)

V. Description of the Co-operative Project

VI. Main Issues of Co-operation between Universities and Schools

1. Was the co-operative Project initiated by the University(ies), by the School(s) or by third body(ies)? How far has it been the result of negotiation between the University(ies) and the School(s)?

2. To what extent is the Project linked to educational policy-making bodies in charge of introducing NIT in schools?

3. How is the co-operation practically organised (e.g. nature of liaison or co-ordinating mechanism, frequency and places of meetings)?

4. How are the teachers compensated for the time spent on the Project? Are they paid or rewarded in one way or another for their participation?

5. Are (graduate or undergraduate) students or teacher trainees involved in the Project? What is(are) their role(s)?

6. What is the status of research into the pedagogical uses of NIT in your university and does it bring sufficient rewards? Of what kind?

7. Highly interactive computer applications require an interdisciplinary approach ranging from education, cognitive science, developmental psychology to computer science and artificial intelligence. How is this interdisciplinary approach organised in your university?

8. Have there appeared problems of communication, expectations between the researchers and teachers or differences of skills which hamper co-operation?

9. How could co-operation be improved?

10. More generally, what are your views on the role that Universities should play in helping schools successfully to introduce information technologies?

VII. Complementary Information

Please add any other information or comments which you believe to be relevant and which have not been covered by this questionnaire.

Part Two

FACT SHEETS ON THE PROJECTS BETWEEN UNIVERSITIES AND SCHOOLS

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Australia

Charles Sturt University - Riverina
Curtin University of Technology
Griffith University
James Cook University of North Queensland
University of Melbourne
Monash University
University of Newcastle
University of New England
Northern Territory University
University of Central Queensland
University of Technology, Sydney
University of Western Australia
University of Western Sydney, Macarthur

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CHARLES STURT UNIVERSITY – RIVERINA
SCHOOL OF EDUCATION

Title of project: WAGGA TECHNOLOGY HIGH SCHOOL PROJECT

Person to contact: Andrew Whelan
School of Education
Charles Sturt University
PO Box 588
Wagga Wagga
New South Wales Australia 2650
Tel. 61 69 22 2441 – Fax: 61 69 22 2639

Duration: Ongoing from December 1989

Funding: Commodore Business Machines

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one upper secondary school:

– To evaluate the classroom uses of computers.

Implementation:

Aspects of the programme include:

Joint curriculum development by the School and the University through: in-service training for teachers; pooling of expertise, including staff development, to support in-service tertiary level courses; visits by school to University computer laboratories to extend the school curriculum; involvement of undergraduate students in school programs, curriculum development and teaching units; feedback to Commodore (which has supplied hardware and software) from both school and University.

The project is concerned with computer use across the curriculum, rather than with using computers to teach about computers.

Products:

Input in teacher training and in-service training courses.

CURTIN UNIVERSITY OF TECHNOLOGY
COMPUTING CENTRE

Title of project: NON-GOVERNMENT SCHOOLS COMPUTING CENTRE

Person to contact: John Winship
Director, Computing Centre
Curtin University of Technology
GPO U1987
Perth WA 6001, Australia

Tel. 61 9 351 7431 – Fax: 61 9 351 2673

Duration: Ongoing from 1984

Funding:
- 1984-1986: Commonwealth of Australia Computer Education Program
- Since 1987: User-Pays basis and subsidies from Western Australia, Educational Computing Consortium.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In primary, lower and upper secondary non-Government schools of Western Australia:

- To provide teacher education on the use of the computer across the curriculum.

Implementation:

The non-Government Schools Computing Centre is a resource and in-service training centre for teachers. An extensive library of software packages has been built up and programmes of in-service training based on the use of software developed. Courses have covered and continue to cover not just introductory computer literacy, but also courses and seminars in the use of computers in a wide range of subject areas. Since 1984 over two thousand teachers from the ninety-one non-Government secondary schools have attended courses at the Centre. In addition, a number of courses have been conducted in non-metropolitan locations.

The Centre has also worked with individual schools on a number of small scale projects which they have proposed . Typical projects included the development of school based activities using Computer Aided Design, computer graphics, word processing and a variety of Computer Based Learning software packages.

Products:

The Centre is now the only in-service and resource centre available in Western Australia for teachers in both Government and non-Government schools. It includes a clearinghouse of information about software, trains teachers in software review and has built up the: "Software and Courseware On-line Reviews" (SCOR) database on the mainframes of the University.

An extensive library of software.

GRIFFITH UNIVERSITY
DIVISION OF EDUCATION

Title of project: COMPUTERS AND HIGHER ORDER THINKING SKILLS

Person to contact: Cathie Sherwood,
Division of Education
Griffith University
Nathan
Queensland, 4111, Australia
Tel. 61 7 875 5617 – Fax: 61 7 875 5910

Duration: From February 1989 to June 1990

Funding:
- Queensland Department of Education and Jacaranda Software (for software)
- Schools (for hardware)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two primary schools:

- To investigate the role the computer and adventure game software can play in providing opportunities for students to engage in higher order thinking processes.

Implementation:

Emphasis is on the learner's capacity to adapt to change and foster abilities in decision-making, problem-solving and other higher order thinking skills which will enable them to think for themselves and transfer these skills effectively from one subject to another. Adventure games were used as a means, rather than LOGO and other programming languages or drill and practice software concentrating on the acquisition of knowledge. The Project studied: to what extent children use higher order thinking skills to solve problems and puzzles in computer adventure games; what teaching and learning strategies could be employed by the teachers to aid their students; whether the age, the gender mix or the number of students at the computer facilitated a higher degree of thinking; collaboration between students at the computer and the implications for curriculum development of the integration of the microcomputer into the classroom.

The teachers and the researchers focused on classrooms as social environments for learning, providing independent inquiry, co-operation, and creative expression. They thus changed from teacher-centred to student-centred, inquiry-based environments.

Products:

Information technology courses in the pre-service and in-service teacher education programme of Griffith University.

Final report February 1991

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JAMES COOK UNIVERSITY OF NORTH QUEENSLAND
MULTIMEDIA LABORATORY

Title of project: THE REMOTE AREA TEACHER EDUCATION PROJECT (RATEP)

Person to contact: Maria Macindoe
Multimedia Laboratory
Department of Social and Cultural Studies in Education
James Cook University of North Queensland
Townsville Q 4811, Australia
Tel. 61 77 81 40 24 – Fax: 61 77 81 51 20

Duration: From January 1990 to July 1992

Funding:
- Queensland Open Learning Project
- Department of Employment, Education and Training

Associated Universities:
- Queensland University of Technology
- Cairns College of Technical and Further Education

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In four state schools:

- To enable adults to upgrade their Associate Diploma in Community Teaching to a Diploma of Teaching in Primary Education.

Implementation:

The Remote Area Teacher Education Project is a complex configuration of people and institutions whose brief is to prepare and deliver higher education teacher education courses via information technology to Aboriginal and Torres Strait Islander students on-site in remote locations, thus obviating the need for students to leave family and community support networks.

Preparation and delivery of the course is based on the use of multimedia information technology to provide teaching and learning materials that are interesting, varied, interactive and culturally appropriate in language and content. The RATEP courses are currently being prepared at the three co-operating institutions. The technology is centred on the Macintosh computer and an authoring language called Authorware Professional.

RATEP is part of the Queensland Open Learning Centre Network, a State Government initiative to test the viability of using information technology to create and deliver higher education to Queenslanders. It will provide a sequence consisting of a one-year certificate, a two-year Associate Diploma, a three-year Diploma in Teaching, and, ultimately, a four-year Degree.

Products:

Final report December 1991.

UNIVERSITY OF MELBOURNE
SCHOOL OF SCIENCE AND MATHEMATICS EDUCATION

Title of project: LEGO – LOGO: KALINDA PRIMARY SCHOOL

Person to contact: Alan Bartram
School of Science and Mathematics Education
Institute of Education
University of Melbourne
ParkvilleVictoria 3052, Australia
Tel. 61 3 344 4000 – Fax: 61 3 344 5104

Duration: Ongoing from August 1990

Funding:
- Univeristy of Melbourne
- Ministry of Education, Victoria
- Kalinda Primary School

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary school:

- To study the effects LEGO-LOGO has on childrens' (girls in particular) attitudes towards and skills in technology;
- To implement LEGO-LOGO as an integral component of the school curriculum.

Implementation:

The project purchased and organised the resources to operate programs. One member of staff was trained in LEGO-LOGO programming. At the onset, a questionnaire was filmed investigating the entry skills and attitudes of the children. The program commenced for a group of year 5 children and the place of LEGO-LOGO in the school program (level, programs, resource needs) was investigated.

The monitoring of the project involved a video film recording of the exit skills and attitudes of the pupils.

Products:

A video and report of the program was produced to meet the requirements of the "seed" grant funding.

Final report June 1991.

MONASH UNIVERSITY
FACULTY OF EDUCATION

Title of Project: CROSS-SECTORIAL TELEMATIC NETWORK PROJECT

Person to contact:
Suzanne Mcnammara
Faculty of Education
Monash University
Rialto Towers
Collins Street
Melbourne VIC 3000, Australia
Tel. 61 3 565 2000 - Fax: 61 3 565 2016

Duration: From August 1990 to December 1990

Funding: Victorian Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In rural primary and secondary schools, technical and further education colleges, statewide in Victoria:

- To provide professional development support to existing and potential users of telematics within all sectors of the Ministry of Education;
- To create links between sectors for the purpose of resource sharing and development.

Implementation:

The project brief is to identify issues associated with cross sectorial resource sharing, provide strategies for facilitating resource sharing and develop policy and structures which will enable the maintenance and efficient usage of the various telematics features and approaches.

Project officers are located in different regions of the state of Victoria. They are responsible for data collection, conduct of professional development, technical support and promotion of the approaches and the development of the documentation associated with the project. Meetings occur weekly via teleconferencing, and include data transfer.

The project is derived from the policy and planning division/schools program division of the Ministry of Education.

Products:

Final report December 1990

UNIVERSITY OF NEWCASTLE
SPECIAL EDUCATION CENTRE

Title of project: DEVELOPMENT OF COMPUTER-BASED INSTRUCTIONAL PROGRAMS FOR CHILDREN WITH DISABILITIES

Person to contact: Philip J. Foreman
Director, Special Education Centre
University of Newcastle, New South Wales
NSW 2308, Australia
Tel. 61 49 21 6292 – Fax: 61 49 21 6908

Duration: From June 1990 to December 1991

Funding:
- Commonwealth Government (Department of Employment, Education and Training, Canberra)
- University of Newcastle

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In primary and secondary education:

- To develop and evaluate systems for establishing computer-based instructional programs in educational content areas relevant to people with special education needs;
- To develop instructional authoring systems which allow educators with no expertise in computer programming to develop software.

Implementation:

At least in the early stages, most of the teachers will be special educators. A series of discrete research studies will evaluate existing authoring systems and commercial software, develop authoring systems appropriate to the systematic teaching of academic skills and functional academics, and evaluate the use of those teaching programs with children with learning difficulties.

Schools have not yet been identified.

Products:

Final report June 1992.

UNIVERSITY OF NEW ENGLAND
CENTRE FOR RESEARCH ON INFORMATION TECHNOLOGY IN EDUCATION

Title of project:	**COMPUTER SUPPORT FOR PROBLEM AREAS IN MATHEMATICS, LANGUAGE AND SCIENCE FROM KINDERGARTEN TO YEAR EIGHT**
Person to contact:	Don Fitzgerald Director, Centre for Research on Information Technology in Education University of New England Armidale 2351 NSW, Australia Tel. 61 67.73 42 03 – Fax: 61 67 72 97 02
Duration:	From February 1990 to 1992+ (long-term project)
Funding:	Toshiba Australia
Associated Universities:	Australian Catholic University (Signadou Campus)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In pre-primary, primary and lower secondary education:

- To survey teachers in all parts of New South Wales, in mathematics, science and language;
- To examine the problems students have in the areas of mathematics and language.

Implementation:

The research program has two distinct phases:

First Phase: To consider areas of the curriculum that present problems for students up to and including year 8. A sample of "expert" teachers have been asked to complete a questionnaire in order to examine their perceptions of the problems students have in the areas of mathematics and language. It is hoped that, by surveying the opinions of a relatively large number of experienced teachers, the areas of the curriculum that present problems for students will be identified.

Second Phase: To develop "intelligent" software for a number of topics, identified as problem areas in phase one. The software will be intelligent in the sense that it will attempt to model the information processing skills of children through an initial series of games and subsequently provide a learning environment appropriate for the child's profile of skills. In addition, the software will record the patterns of performance of the individual child and adapt subsequent learning tasks to prior performance. The "mental models" that will form the basis of this research have been developed from psychometric research on children's information processing skills conducted at the University of New England.

Products:

The outcomes of the study will be made available to the State Department of Education.
Interim report on phase one of the project, November 1990.

NORTHERN TERRITORY UNIVERSITY
COMPUTER EDUCATION CENTRE

Title of project: TRAINING TEACHERS IN THE USE OF INFORMATION TECHNOLOGIES

Person to contact: Robert Chirgwin
Computer Education Centre
Northern Territory University
PO Box 40146
Casuarina NT 0811, Australia

Tel. 61 89 466 666 – Fax: 61 89 270 617

Duration: Ongoing from January 1987

Funding:
- Northern Territory University
- Northern Territory Education Department

Other Partner: Northern Territory Education Department, Darwin

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In all schools in the Northern Territory, pre-primary, primary, junior and senior secondary:

- To develop in trainee teachers: the skills necessary to use appropriate new information technologies as an aid to their studies; knowledge of the pedagogical uses of computers; experience of using new information technologies, including computer hardware, software and peripherals of the same types that are used in schools;
- To provide practising teachers with training in the use of new information technologies in schools.

Implementation:

Trainee teachers are provided with the training through formal award courses. In service teachers are trained through non award short courses. Both trainee teachers and practising teachers receive instruction on the same equipment as that used by children in schools, and are taught by the advisers who visit schools to assist with the planning and development of school new technology resources. The same advisers are involved in curriculum and policy development.

In addition, the Centre: undertakes research into the applicability of emerging technologies to education; reviews new computing software and advises teachers on developments; assists with the development of post-graduate awards for trainee and practising teachers.

Products:

The project has a direct link to the Northern Territory Education Department policy-making process and as such provides input into the development of new information technologies policy in schools.

Annual reports.

UNIVERSITY OF CENTRAL QUEENSLAND
SCHOOL OF EDUCATION

Title of project: TALKING WORD PROCESSORS AND TEXT EDITING FOR VISUALLY IMPAIRED CHILDREN: A CASE STUDY

Person to contact: Peter Hallinan
School of Education
University Campus of Central Queensland
Rockhampton
Qld 4702, Australia
Tel. 61 79 36 97 77 – Fax: 61 79 36 13 61

Duration: From July to December 1987

Funding: University of Central Queensland

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

At a state primary school (in a special education unit - in this case, visual impairment):

– To investigate the use of talking word processors and text editing for visually impaired children.

Implementation:

An Amiga 500 micro-computer with a talking word processor was installed in a special education unit, for use by a visually impaired pupil, over two school terms.

The project was initiated by the University, following negotiations with the teachers, the parents and the student concerned.

It was viewed as a pilot case study, and the paper reviews the challenges and limitations posed by the introduction of new technology.

Products:

Final report in the Journal of Visual Impairment and Blindness, December, 1990, pp. 552-555.

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UNIVERSITY OF TECHNOLOGY, SYDNEY
SCHOOL OF TEACHER EDUCATION

Title of project: INNOVATION IN TECHNOLOGY EDUCATION

Person to contact: Mark Cosgrove
School of Teacher Education
University of Technology, Sydney
Kuring-gai Campus
PO Box 123
Broadway, NSW 2007, Australia
Tel. 61 2 218 9104 – Fax: 61 2 281 2498

Duration: Ongoing from October 1990

Funding: – North West Region, New South Wales, Department of School Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In an upper secondary school:

– To develop the school curriculum, using the most modern new information technologies.

Implementation:

The project is essentially a curriculum development operation in which teachers will try to use the most modern techniques of teaching with the most modern equipment available. The intent is to bring the students to a state of learning whereby techniques such as robotics become part of the classroom environment.

The organisation of the project is through consultation. Several one day workshops will be operated for teachers using research-based curriculum packages developed at the University.

Products:

Curriculum development.

UNIVERSITY OF WESTERN AUSTRALIA
CENTRE FOR RESEARCH ON RURAL EDUCATION

Title of project: COMPUTER-BASED DELIVERY OF EARLY EDUCATION IN NUMERACY AND LITERACY FOR CHILDREN OF ITINERANT FAMILIES

Person to contact: Ian Birch, Mike Lally
Department of Education
The Rural Education Research Centre
University of Western Australia
Nedlands WA, Western Australia 6009
Tel. 61 9 380 3838 – Fax: 61 9 382 4071

Duration: From December 1988 to January 1991

Funding:
- Bernard van Leer Foundation of the Netherlands
- University of Western Australia

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six schools, pre-primary to Year 3:

- To use computer technology together with telecommunication to provide some continuity for early education in reading, writing and numeracy in children in their early years who come from families which are itinerant.

Implementation:

All the schools, equipped with computer and modem, are located in the north-eastern goldfields of Western Australia where the population is largely itinerant. Educational programs are presented via the computer, and names of children, together with their school results are maintained as part of a computer day file. This information is sent to a central computer at the University once a week. When a child moves from one school to another, that child's name and track record are moved from one section of the database to that associated with the school to which the child is moving.

A large number of students involved in the project come from an Aboriginal background; therefore, many of the programs have been written using a context which is familar and culturally relevant to those children, e.g. numeracy games are based on hunting a kangaroo. The same concepts are taught to non-Aboriginal children using a game of either moving sheep into a yard or finding a nugget in a gold mine. A considerable number of programs have been developed covering the areas of reading, writing and numeracy.

Products:

Approximately 40 different programs have been developed over the three year span of the project. Final report January 1991.

UNIVERSITY OF WESTERN SYDNEY, MACARTHUR
SCHOOL OF EDUCATION AND LANGUAGE STUDIES

Title of project: INFORMATION SKILLS AND TECHNOLOGIES

Person to contact: Toni Downes
School of Education and Language Studies
University of Western Sydney, Macarthur
Post Office Box 555
Campbelltown NSW 2560, Australia
Tel. 61 46 20 3100 – 61 46 28 12 98

Duration: From August 1989 to December 1991

Funding:
- University Research Grant
- Apple Australia (equipment loan)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To evaluate the use of computerised data systems as an information processing tool in the social studies and science curricula;
- To contribute to knowledge about primary-age students' information handling skills and identify the key factors which maximise or lessen the utility of computerised data-base systems in the classroom;
- To provide software specifications for information handling packages for primary aged students and curriculum guidelines and ideas for teachers.

Implementation:

The information processes that students use will be indentified and analysed in terms of the capabilities of current technologies found in classrooms. Key factors which affect the use of these systems will also be investigated (management of teaching, including resources; the students' learning processes; the task at hand; the features and functions of the available technology).

The basic methodology of the project is the case study. Up to ten primary classrooms in suburban Sydney schools will be studied, with data being collected by interviews, observations, questionnaires and the gathering of pertinent artifacts (e.g. examples of students' work). In 1990, the following hardware and software will be used in the classrooms: Mac with EXCEL, Apple II with Fredbase software: BBCs and The Information Handling PACK MESU, England. This configuration of software signals a second phase in the project where the capabilities of available software can be investigated in terms of student needs.

Products:

Final report December 1992.

Austria

University of Klagenfurt (2)
Vienna Technical University

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UNIVERSITY OF KLAGENFURT
INSTITUTE OF MATHEMATICS

Title of project: DEVELOPMENT AND EVALUATION OF MICRO-WORLDS IN MATHEMATICS TEACHING

Person to contact: Gerd Kadunz
Institute of Mathematics
University of Klagenfurt
Universitätsstr. 65-67
9022 - Klagenfurt, Austria

Duration: From June 1987 to June 1991

Funding: University of Klagenfurt

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one lower and upper secondary school (10-14 years)

- To develop an user-friendly and object-oriented software with emphasis on the process of drawing for teaching geometry (not geometric drawing).

Implementation:

The project will concentrate on:

- Application of constructions in geometry for lower secondary level students;
- Presentation of assumptions in geometric configurations in the sense of an operative principle by interactive variation of graphs and figures;
- Inductive problem-solving;
- Experimental search for problem-solving strategies;
- Decision support by the means of demonstration and visualisation.

Products:

Final report June 1991.

UNIVERSITY OF KLAGENFURT
INSTITUTE OF MATHEMATICS

Title of project:	SYSTEM DYNAMICS IN MATHEMATICS COURSES IN SECONDARY SCHOOLS
Person to contact:	Günther Ossimitz Institute of Mathematics University of Klagenfurt Universitätsstr. 65, 9020 - Klagenfurt, Austria Tel. 43 463 5317
Duration:	From January 1989 to August 1990
Funding:	University of Klagenfurt
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one upper secondary school

- To develop and partly evaluate practical materials for teaching system dynamics.

Implementation:

The materials consisted mainly of modelling examples, background information about the modelling process, and a software environment for computer simulations. Most of the models were designed for numerical simulation on computers (MS-DOS PC) with various software products (DYNAMO-like simulation software, spreadsheets); some models were designed for mere qualitative modelling without computer aids.

One major task was to explore how different ways of denoting dynamic models (verbal, graphical, numerical representations) could be used for generating new insights into the dynamic behaviour of the modelled issue. It was found that qualitative modelling needs representations different from quantative modelling.

Practical teaching experiments made the completed materials suitable and convenient for teaching. The threshold for teachers to enter the new field of teaching system dynamics was made as low as possible.

The project is a result of a recent reform of the mathematics curriculum, which introduced system dynamics as a new component in Grade 11 (16-17 years) of the "Realgymnasium".

Products:

Report published: Ossimitz G. (1990): Materialen zur Systemdynamik. Wien: Hölder-Pichler-Tempsky.

VIENNA TECHNICAL UNIVERSITY
INSTITUTE FOR INFORMATICS APPLICATION

Title of project: LEARNING WITH COMPUTERS – FUNCTIONS AND GRAPHS

Person to contact: Eveline Riedling
Institute for Automation
Vienna Technical University
Treitlstr. 3
1040 Wien, Austria
Tel. 43 222 588 01-8161 – Fax: 43 222 505 2666

Duration: From January 1988 to April 1990

Funding:
- Ministry of Education
- Ministry of Science and Research

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one school, primary and lower secondary:

- To identify the learning processes which occur in computer aided learning in mathematics.

Implementation:

The research concentrates on the specific contribution the computer can make to stimulate childrens' learning, so that computers can be used most efficiently. The second feature of the project, therefore, is the evaluation of software, to identify the types which specifically stimulate childrens' learning processes. The software was selected by the project manager, and the development itself was done by the students.

A report on the program is being made by the children themselves - stating new, exciting, difficult, motivating or frustrating learning events which occurred during the program sessions. The final report identifies more precisely efficient types of programs; helpful combinations of different types of software, difficulties in some sorts of knowledged-representations in programs and the outcomes of the learning process.

Products:

Final report May 1990.

Belgium

Free University of Brussels (VUB)

State University of Ghent

University of Liège (4)

Catholic University of Louvain (KUL) (2)

University of Mons (2)

Notre-Dame de la Paix University Faculties, Namur (2)

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FREE UNIVERSITY OF BRUSSELS (VUB)
STATE UNIVERSITY OF GHENT
CATHOLIC UNIVERSITY OF LOUVAIN (KUL)
UNIVERSITY CENTRE OF ANVERS
UNIVERSITY CENTRE OF LIMBOURG

Title projet : A COMPUTER IN THE CLASSROOM

Person to contact: Hugo Buermans
Director, Distance Learning Department and
Media and Technology Department
Ministry of Education
Kunstlaan 43
1040 - Brussels, Belgium

Tel. 32 2 513 74 64

Duration: Ongoing from February 1988

Funding: Ministry of Education

Associated Universities:
- Ministry of Education (Distance Learning Department and Centre for Media Education)
- State Education Services
- Communal Education Services
- Provincial Education Services
- Catholic Education Services
- Education Service of Public Television

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To improve training of the teaching staff in the use of multimedia (i.e. a total of more than 70 000 persons) in all the schools (3 500) of the Flemish-speaking Community in Belgium.

Implementation:

The course comprises three elements:

- Four self-teaching and self-assessment manuals aimed at creating awareness of the computer as a teaching aid, demonstrating its use as an instructional medium for traditional subject matters and describing the advantages of using software and hardware;
- Sixteen television spots screened by Flemish Radio and Television describing the content of these manuals;
- Training Centres in 61 schools, university centres, institutes for Teacher Education which allow teachers to use their personnel and computer facilities.

Products:

- The manuals are distributed free of charge to teachers.
- Videos and software are distributed to the schools by the Centre for Media Education of the Ministry of the Flemish Community.

STATE UNIVERSITY OF GHENT
EDUCATIONAL INFORMATION SCIENCES (EDIF)

Title of project: PRIMARY SCHOOL TEACHER EDUCATION IN NEW INFORMATION TECHNOLOGIES

Person to contact: G. Schuyten
Educational Information Sciences
Department of Education
State University of Ghent
H. Dunantlaan 1
9000 - Ghent, Belgium

Tel. 32 91 25 41 00 – Fax: 32 91 23 24 72

Duration: From 1985 to present

Funding:
- Ministry of Education
- State University of Ghent

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aim:

- To provide primary school teacher education in computer applications and particularly in the use of LOGO-microworlds.

Implementation

Between 1985-89, four "action-research oriented" projects were set up, each involving 40 teachers from seven elementary schools in Ghent. The objectives were the development of: mathematical concepts and skills of pupils; computer literacy of teachers; ability of teachers to use the new tools to pursue mathematical objectives; ability of the teachers to rethink approaches to teaching and learning in primary school, using a "constructivist" approach.

Teacher education courses involved: introduction to LOGO; the relation between LOGO and the mathematics curriculum; the use of microworlds in daily teaching practice and the acquisition of the necessary skills to integrate this new knowledge into teaching practice.

Products:

The EDIF team played a major role in Flanders in the preparation of the national Plan to introduce computers in State primary schools and in the organisation of a compulsory in-service programme for all primary school teachers (started in 1990), especially in relation to the use of LOGO-based learning environments.

The role of the University is now restricted to the development of teacher training materials or software packages.

UNIVERSITY OF LIEGE
EDUCATIONAL TECHNOLOGY DEPARTMENT

Title of project: BANK OF QUESTIONS FOR THE BELGIAN AIRFORCE'S TECHNICAL SCHOOLS

Person to contact: Dieudonné Leclercq
Director, Educational Technology Department
Faculty of Psychology and Educational Sciences
University of Liège
Sart Tilman, Bâtiment B32
4000 - Liège, Belgium

Tel. 32 41 56 20 72

Duration: Ongoing from 1971

Funding: Ministry of Defence

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To build up a bank of multiple choice questions.

Implementation

The Belgian Airforce's Technical School located at Saffraanberg, acting as the co-ordinating centre and in conjunction with the instructors from ten other technical schools, has defined the subject matters for each branch of activity (e.g. electricity, electronics, mechanical engineering, etc. and all the basic subject matters). The questions sent in by the instructors are vetted by the Centre, encoded and translated into the two other languages (French, Dutch and English being the three working languages); the Centre periodically publishes listings for instructors in a particular field.

Products:

Elise Boxus, "Les QCM à solutions générales au service de l'évaluation à livre ouvert, Colloque Formation, Evaluation, Sélection par questionnaires fermés", Marne-La-Vallée, ESIEE, 1988, p. 318-331.

UNIVERSITY OF LIEGE
EDUCATIONAL TECHNOLOGY DEPARTMENT

Title of project: COMING TO TERMS WITH COMPUTERS – THE INTRODUCTION OF NEW INFORMATION TECHNOLOGIES IN PRIMARY EDUCATION

Person to contact: Dieudonné Leclercq, Director
Sylvie Osterrieth,
Educational Technology Department
Faculty of Psychology and Educational Sciences
University of Liège
Sart Tilman, Bâtiment B32
4000 - Liège, Belgium

Tel. 32 41 56 20 72

Duration: From January 1987 to December 1988

Funding: Commission of the European Communities Task Force: Human Resources, Education, Training and Youth

Associated Universities:
- Loughborough University, United Kingdom
- Distance Learning Centre, France

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To monitor the introduction of computers for educational purposes in primary schools where they have never been used before, and their utilisation by teachers with no previous experience of this equipment. This being an international co-operative project, it was decided to monitor one school in Belgium, one in France and one in England.

Implementation

It was decided to investigate three aspects and to divide these among the three participating countries as follows:

- ***Belgium.*** "How do teachers prepare themselves for this? How do they reorganise their lessons?"
- ***United Kingdom.*** "What is the degree of pupil activity and the knowledge and attitudes they acquire?"
- ***France.*** "What influence does the sociological environment have?"

Various methods have been used for training the teachers. In each case, the teachers themselves have decided for what purpose the computers should be used. The university teams were there to answer questions, provide the hardware and software, and to observe how the teaching/learning process operated.

Products:

A work by S. Osterieth, "L'informatique tranquille", published by Organisation des Etudes (1990); "Coming to Terms with Computers in Three Countries" (English version), together with various more detailed reports on specific aspects.

UNIVERSITY OF LIEGE
· EDUCATIONAL TECHNOLOGY DEPARTMENT

Title of project: EVALUATION OF EUROPEAN PROJECTS ON EQUALITY OF OPPORTUNITIES AND NEW TECHNOLOGIES

Person to contact: Dieudonné Leclercq
Director, Educational Technology Department
Faculty of Psychology and Educational Sciences
University of Liège
Sart Tilman, Bâtiment B32
4000 - Liège 1, Belgium

Tel. 32 41 56 20 72

Duration: July 1989 to January 1990

Funding:
- Commission of the European Communities,Task Force Human Resources, Education, Training and Youth

Associated Universities:
- Universities of Paris-Nanterre (France); Venice (Italy); Coimbra (Portugal); Laude Institut für Schule Weiterbildung (Germany); University of Limerick, (Ireland) and C.E.P. Palma de Mallorca, (Spain)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In secondary schools and some primary schools in seven countries:

- To develop and implement a common methodology of project evaluation in teaching new information technologies in schools, to encourage girls to participate as much as boys.

Implementation

Projects identified problems of gender and technology in target populations (mainly students, teachers, parents and guidance counsellors) as well as various issues (lack of texts describing results, lack of specialised agencies in these matters, etc.).

A set of evaluation tools (mainly participant-observation, questionnaires and interviews) was devised by the transnational team so as to aid the nine project evaluators to observe in a coherent fashion the different phases of the school projects: their definition, planning, execution, internal assessment procedures and their orientation. The strategies most frequently employed, involving both teachers and pupils in the schools, were discussions or debates, training courses, production of educational materials, open days and work in small groups.

Products:

Synthesis Report: Sylvie Osterrieth (ed.): "Equal Opportunities and New Information Technologies", April 1990, published by the CEC - Task Force Human Resources CM-70-91-500-EN-C and Complete Report and Annexes: Sylvie Osterrieth (ed.), January 1990, STE, University of Liège.

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UNIVERSITY OF LIEGE
EDUCATIONAL TECHNOLOGY DEPARTMENT

Title of project: LEARNING ENVIRONMENTS

Programme a) – Peripatetic LOGO seminars
Programme b) – Peripatetic robotics seminars
Programme c) – Study of teacher-pupil interactions

Person to contact: Dieudonné Leclercq
Educational Technology Department
Faculty of Psychology and Educational Sciences
University of Liège
Sart Tilman, Bâtiment B32
4000 - Liège, Belgium

Tel. 32 41 56 20 72

Duration: Programme a) – October 1982 – June 1983
Programme b) – January 1990 – October 1990
Programme c) – October 1982 – June 1990

Funding: Ministry of Education (French-speaking Community)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

a) To provide primary school children (and particularly those from disadvantaged neighbourhoods) with a certain degree of computer literacy;
b) To train teachers in the use of educational robotics in pre-primary and primary schools so as to motivate the children subsequently to use advanced technologies;
c) Analyse teachers' performance so that they can adjust their approach and are made more aware of the impact of their educational action.

Implementation

The researchers train the teachers who remain the "decision-makers" in this area. They analyse how realistic and effective these teachers are and investigate the difficulties and obstacles encountered in introducing a robotics and/or computer activity.

The teachers are therefore instructed in the use of LOGO and robotics and given classroom back-up, and their performance is observed and analysed.

Products:

Brigitte Denis "La régulation en milieu LOGO", PhD., University of Liège, 1990.
Jacques Sougne, Logo SCAN, "A tool kit to analyse Logo programs", in Estes.
J. Heene, D. Leclercq, "Proceedings of the Seventh International Conference on Technology and Education", Brussels, 1990, Vol. 2, 313-315

CATHOLIC UNIVERSITY OF LOUVAIN (KUL)
CENTRE FOR INSTRUCTIONAL PSYCHOLOGY

Title of project: DEVELOPMENT OF THINKING SKILLS THROUGH COMPUTER LEARNING ENVIRONMENTS

Person to contact: Erick De Corte
Centre for Instructional Psychology and Technology
Department of Education
Catholic University of Louvain
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3000 - Louvain, Belgium

Tel. 32 16 28 62 48 – Fax: 32 16 28 62 00

Duration: From January 1990 to September 1990

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To train, in primary schools in the provinces of Brabant and Antwerpen, a group of 5th and 6th grade teachers (who had followed an introductory course in LOGO) in the application of LOGO for developing thinking skills in chidren.

Implementation:

This was accomplished on the basis of the know-how acquired in the past few years in the Center for Instructional Psychology in the project "Computers and Thinking". A powerful teaching/learning environment was constructed, aiming at the acquision of the basic concepts of LOGO and the mastery of thinking skills that are characteristic of good programming, as well as the transfer of these skills to other domains.

A series of training sessions was organised. Each session involved two parts. In the first, more theoretical part, the know-how developed in the research center was shared with the teachers. In a practically oriented part, the teachers had ample opportunity to practise and discuss the newly learned material at the computer.

Products:

A handbook for teachers who plan to use LOGO in their classroom was compiled.

CATHOLIC UNIVERSITY OF LOUVAIN (KUL)
DIDACTICS OF PHYSICS DIVISION

Title of project: USE OF MICROCOMPUTERS IN SCIENCE TEACHING

Person to contact: R. Boving
Didactics of Physics Division
Catholic University of Louvain
Naamestraat 61
32000 - Louvain, Belgium
Tel. 32 11 22 9981

Duration: From September 1987 to August 1990

Funding: Ministry of Education

Associated Universities: Limburg University Centre, Belgium

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In lower and upper secondary education:

- To train teachers in the use of the microcomputer in the teaching of biology, chemistry and physics;
- To produce new software;
- To develop an interface to use the microcomputer in scientific experiments.

Implementation:

The course was implemented through teacher training in didactics and informatics.
Frequent meetings were organised between researchers and teachers.

Products:

New software progams for use in teaching. Increased interface capacity for the use of computers in practical experiments.

Final report January 1991.

UNIVERSITY OF MONS
EDUCATIONAL TECHNOLOGY UNIT

Title of project: STUDY OF THE EDUCATIONAL USES OF CERTAIN SPECIALISED SOFTWARE PACKAGES

Person to contact: Christian Depover
Educational Technology Unit
Faculty of Psycho-Educational Sciences
University of Mons
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7000 - Mons, Belgium

Tel. 32 65 37 31 22 – Fax: 32 65 37 30 54

Duration: From December 1989 to November 1990

Funding: – Ministry of Education for the French-speaking Community of Belgium

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five primary schools:

– To design teaching/learning situations utilising the various resources of specialised software packages (spreadsheets, word processing, databases) and methodologies for the most effective use of the aids devised (worksheets).

Implementation

Carrying out trials of the proposed methodologies and the aids that have been devised involves, on the one hand, training the teachers in the use of these software packages in their instruction and, on the other, the carrying out of exercises developed in the classroom both by the teachers and by the researchers.

Products:

Final report November 1990.

UNIVERSITY OF MONS
EDUCATIONAL TECHNOLOGY UNIT

Title of project: SYMUL-METAL PROJECT

Person to contact: Christian Depover
Educational Technology Unit
Faculty of Psycho-Educational Sciences
University of Mons
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7000 - Mons, Belgium

Tel. 32 65 37 31 17 – Fax: 32 65 37 30 54

Duration: From April 1989 to September 1993

Funding:
- Non-Ferrous Metals Information Centre
- Industrial Partners: ACEC-UM, Asturia de Zinc, Centre du Zinc
- COMETT Project

Associated Universities:
- University of Valenciennes, Institute of Educational Training and Research
- Institut for Employment and Professional Training, Lisbon, Portugal

BRIEF DESCRIPTION OF THE PROJECT

Aims:

Phase 1. To design a hardware and software system of multimedia training (computer and videodisk) on the basic concepts relating to corrosion and anti-corrosion.

Phase 2. To use this software in the training of teachers in upper secondary technical education and to test it out in pilot schools.

Implementation

The SYMUL-METAL Project is a training course using an interactive videodisk which will comprise four modules:

- An instructional module designed to teach the learner how the phenomenon of corrosion operates; the chemical processes are demonstrated by means of simulated experiments;
- A module describing modern methods of controlling corrosion;
- Two modules which will be designed for advanced students to teach them how to select and apply the appropriate technology depending on the situation and the type of items to be protected.

The project involves using the first two modules as part of a programme of instruction for teachers and, subsequently, their students.

Products:

A hardware and software system of multimedia training.

NOTRE-DAME DE LA PAIX UNIVERSITY FACULTIES
DEPARTMENT OF EDUCATION AND TECHNOLOGY

Title of project: ON-THE-JOB TRAINING FOR TEACHERS

Person to contact: Jean Donnay
Department of Education and Technology
Notre-Dame de la Paix University Faculties
61, rue de Bruxelles, 5000 - Namur, Belgium
Tel. 32 81 72 50 65

Duration: October 1990 to September 1992

Funding:
- Notre-Dame de la Paix University Faculties, Namur
- Ministry of Education and Training for the French- speaking Community

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

The aim of the project, which is being conducted in six primary schools, is to provide on-the-job training for teachers. This involves:

- Designing and disseminating a learning environment incorporating several media and intended for use in basic education within the French-speaking Community in Belgium;
- Training a group of teachers to design, manage and evaluate a teaching and learning environment incorporating different media, using the EPIDO concept (a multimedia package to enhance use of the computer in education) devised by APO Québec (Applications Pédagogiques de l'Ordinateur);
- Analysing and evaluating the training procedure adopted so as to help in defining policies with regard to in-service training and, in particular, on-the-job training;
- Creating, in conjunction with the teachers themselves, tools for analysing their approaches and methods..

Implementation

The training is based on a twofold approach: a) learning how to develop tools (i.e. acquiring the necessary technical skills so as to be able to design small-scale applications and think up possible contexts in which these can be used) and b) developing tools for self-instruction (i.e. using the detailed knowledge required for any design work involving new information technologies to develop the ability to analyse and improve one's own methods). Educational tools will be evaluated on the basis of a systematic feedback between design and experimentation in the classroom, involving the participation of outside observers (researchers and teachers).

Products:

- A multimedia package will be created including a teacher's guide and a pupil's guide.
- Throughout the period of training a systematic record will be kept of participants' reactions to and comments on the incorporation of new information technologies into the teaching/learning process. A final evaluation of the entire training process will be made in October 1992. This report could contribute to the development of an in-service training policy based on on-the-job learning.

NOTRE-DAME DE LA PAIX UNIVERSITY FACULTIES
DEPARTMENT OF EDUCATION AND TECHNOLOGY

Title of project: TRAINING TEACHERS TO DEVISE APPROACHES INCORPORATING APPLICATIONS SOFTWARE AS AN INSTRUCTIONAL TOOL IN THE TEACHING OF SCIENCE

Person to contact: J. Brüll-Guillaume
Department of Education and Technology
Notre-Dame de la Paix University Faculties
61, rue de Bruxelles
5000 - Namur, Belgium

Tel. 32 81 229 061

Duration: From May 1987 to June 1988

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For teachers in secondary and technical schools of the French-speaking Community in Belgium:

1. Instruction in the basic concepts of computer science and the use of software packages;
2. Exploration of ways of incorporating these aids in science teaching;
3. How to adapt the methods of science teaching so as to accommodate the computer as an effective tool;
4. Training in developing tools, and in developing tools for self-instruction.

Implementation:

1. Technical training in the basic concepts of computer science and applications software, comprising ten sessions each lasting one day;
2. Two days devoted to discussion and consideration of the use of software packages as teaching and learning tools. As part of this, the university researchers suggested a series of educational utilisations for applications software. Groups of teachers subsequently worked out proposals for incorporating computers in the teaching of science.

Products:

A group of forteen science teachers from various schools in the Provinces of Hainault and Brabant underwent this training.
Five software packages were developed, three using LOTUS and two dBASE III Plus.
Final report published in May 1989.

Canada

University of Calgary
Concordia University
Laurentian University
University of Ottawa
University of Toronto (3)
York University

UNIVERSITY OF CALGARY
DEPARTMENT OF CURRICULUM AND INSTRUCTION

Title of project: 1. DISTANCE LEARNING IN SMALL SCHOOLS PROJECT
2. DISTANCE LEARNING PROJECT NORTH

Person to contact: W. Bruce Clark
Department of Curriculum and Instruction
University of Calgary
702 Education Tower
2500 University Drive NW
Calgary, Alberta, Canada T2N 1N4

Tel. 1 403 220 5110

Duration: From March 1988 to January 1990

Funding:
- Alberta Education
- Schools juridictions

Associated Universities: University of Alberta

BRIEF DESCRIPTION OF THE PROJECT

Aims:

1. Distance learning in *Small Schools Project.* In 28 upper secondary schools in the southeast quadrant of the Province of Alberta (co-ordinated through a distance education office): to increase the course offerings in very small high schools (11-75 students usually).
2. Distance learning *Project North.* In 26 upper secondary schools in the northern part of the Province of Alberta (co-ordinated through the Alberta Correspondence School): to widen the mathematics curriculum.

Implementation:

Project 1. Independent study by the students using materials from the correspondence school. These were supported by a network of tutor-markers who were linked to the schools by Fax and telephone. Some teleconferencing (audio) also took place.

Project 2. Primarily mathematics, though in some schools subjects included German, physics and accounting. The project used computer managed learning as a means of offering a wider variety of mathematics courses than could be offered in the traditional classroom fashion. Some schools also shared teacher resources through teleconferencing.

Evaluation (the principal role of the University) focused on management issues. However, pedagogical issues emerged as being more serious, i.e. the technologies employed both enable and constrain; where only independent study is offered, goals which could not be met through independent study are not addressed; other goals are either ignored or reshaped to match the capabilities of technology. These issues are expected to spawn a new series of project.

Products:

Final report May 1990.

CONCORDIA UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
DEPARTMENT OF EDUCATION

Title of project: TEACHING INDUSTRIAL ELECTRONICS BY MEANS OF A SIMULATION LABORATORY

Person to contact: Geza Joos
Department of Electrical and Computer Engineering
Gary M. Boyd
Department of Education
Concordia University
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Montréal, Québec, Canada H3G 1M8
1 514 848 2424 - Fax: 1 514 848 3494

Duration: From January 1989 to December 1993

Funding: Ministry of Higher Education and Science, Québec Government

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In three technical education colleges in Montreal:

- To provide teachers and students with new and better tools for conveying the most up-to-date knowledge and techniques used in industrial electronics.

Implementation

This involves a new approach to the teaching of the practical aspects of the subject: a laboratory using simulation software and microcomputers. This simulation laboratory will operate on the basis of a combination of learning theories appropriate to the teaching of industrial electronics and methods of computer-based instruction.

This project is of the nature not only of a *research and development* project, since its purpose is to develop instructional material for teaching practical knowledge and aspects of equipment operation, but also of a *research-action* project since it includes experimentation and the adaptation of different training models.

The team is pluridisciplinary and made up of an educational psychologist, two teachers from the two disciplines, teachers from the college sector and representatives of industry.

Products:

The object is to find an alternative for some of the physical operations currently performed in traditional laboratories.

Final report December 1993.

LAURENTIAN UNIVERSITY
SCHOOL OF EDUCATION

Title of project: PILOT SCHOOLS PROJECT

Person to contact: Jean Séguin
School of Education
Laurentian University
Ramsey Lake Road
Sudbury, Ontario, Canada P3E 2C6
Tel. 1 705 675 1151

Duration: From June 1987 to December 1988

Funding:
- Ontario's Ministry of Education
- Sudbury District Roman Catholic School Board
- Laurentian University

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In primary and secondary schools, and in French-speaking schools:

a. Demonstrate and record how courseware is used in the classroom;
b. Advise the Ministry of strategies for implementing "Pilot Schools" projects;
c. Examine how the courseware supports the curriculum objectives set by the Ministry and the School Board and how this courseware helps to improve pupil performance.

Implementation:

a. A number of innovative projects involving the use of computers in education were devised, implemented and evaluated in three French-speaking schools. These innovative projects addressed pupils'fi prime learning needs using the most promising French-language courseware packages.

b. The individual reactions of those involved at the different stages of the implementation of these innovations were analysed, as was the degree of success of each computer application. Recommendations regarding different implementation strategies were made to the Ministry of Education.

c. A critical assessment was made of the activities and outcomes with regard to the use of the different courseware packages.

Products:

The creation of teaching guides to accompany the best available French-language courseware packages. The provision of training and appropriate support for teachers so that they can incorporate some of these software/courseware packages in their classroom teaching.

Report February 1989.

UNIVERSITY OF OTTAWA
FACULTY OF EDUCATION

Title of project: STUDY OF THE EDUCATIONAL IMPACT OF NEW TECHNOLOGIES

Person to contact: Pierre Michaud
Faculty of Education
University of Ottawa
651, Cumberland Street
Ottawa, Ontario K1N 6N5, Canada
Tel. 1 613 564 4296

Duration: From September 1987 to September 1990

Funding:
- Ontario's Ministry of Education
- Ottawa-Carleton French Language School Board

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To study the impact of technology on teaching/learning processes, subject matters and the management of education in the case of first cycle secondary pupils.

Implementation:

This was a three-year longitudinal study on the same cohort of pupils (aged 12/13 at the outset) covering their final two years of schooling at this level and their first year at a higher level. The teachers were given constant pedagogical and technical support. They were supplied with computer equipment approved by Ontario's Ministry of Education.

Products:

Final report 1991.

UNIVERSITY OF TORONTO
COMPUTER SYSTEMS RESEARCH INSTITUTE

Title of project: MULTIMEDIA HYPERMEDIUM IN THE CLASSROOM

Person to contact: Martin Lamb
Research Associate, Computer Systems Research Institute
University of Toronto
Toronto, Ontario M5S 1A1, Canada
Tel. 1 416 978 2011

Duration: From May 1990

Funding: Toronto Board of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To observe teacher-student interaction when using *Menulay* in order to understand what supplementary materials are required to best use it in the Ontario curriculum (*Menulay* is a software utility which allows the individual to create full-colour, interactive programs featuring text, pictures, animation, music, speech and sound effects without writing a single line of programming code);
- To develop resource materials for teachers to introduce them to Menulay;
- To hold 20 hands-on workshops which will show teachers how to use Menulay in the classroom and how to integrate it with the Ontario curriculum.

Implementation:

A secondary public school was chosen to test *Menulay*. The teacher in charge and selected students provided formative evaluation to the university researchers in order to reshape the product. As a result of observations of teacher-student interaction with *Menulay*, it was determined that teachers in the Toronto Board, and elsewhere in Ontario. would require four types of implementation assistance: a floppy disk that would contain examples demonstrating special features, a videotape that would demonstrate classroom examples, a teacher's guide that would suggest a number of possible cross-curricular applications and a series of workshops to assist teachers with a hands-on introduction to *Menulay*.

Products:

Using ICONs computers connected to videodisks and interactive videos has allowed students to explore the world of multi-media - linking text with still photos, with moving pictures, with music. Furthermore, considerable progress has been made towards the goal of the four implementation products.

UNIVERSITY OF TORONTO
TECHNOLOGY FOR ENHANCING LEARNING CENTRE

Title of project: DURHAM TEL PROJECT

Person to contact: Robert D. Cook
Head, TEL Centre, Faculty of Education
University of Toronto
371 Bloor Street W.
Toronto, Ontario M5S 2R7, Canada
Tel. 1 415 978 7880 – Fax: 1 416 978 5775

Duration: From September 1989 to June 1992

Funding: Centre for Curriculum Resources and Technologies

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

This is a specific project of the TEL Centre, which is part of the Faculty of Education. The ultimate goal is to serve learners in Ontario Schools through effective teacher education. More specifically, the TEL Centre's mission is to enhance teacher education by achieving the appropriate use of new technology in all areas of FEUT activity. This includes several components: involvement with teacher education programs and faculty to assist new and practicing teachers to use television, computers and other electronic technologies: supporting the administrative use of technology, supporting academic and administrative staff in learning to use technology to increase their professional productivity: supporting faculty research, including investigation of how technology can be used to improve learning. The Centre's goals are accomplished through both ongoing services and specific projects.

Aims:

In seven schools, in lower and upper secondary education, in cross-curricula subjects, plus English and French language, drama and science:

- To implement and evaluate a model of teacher education which will permit teachers at all stages of their professional education to integrate technological teaching and learning tools into their curricula.

Implementation

The project uses collaboratiuve and peer coaching strategies. In the first year, teachers learned a range of innovative uses of computer, video and other technologies. They then developed and delivered substantial curriculum-based projects in each of their schools. Both process and outcomes were monitored by an external evaluator.

In the second and third years, each experienced group will coach a new team in another school, thus expanding the total number of schools affected. Student teachers will carry their skills back to other developing teachers and, upon graduation, to even more schools as they assume their appointments in other school jurisdictions.

A project advisory committe meets four times a year to review progress and suggest new directions.

Products:

Reports annually in September. Final report September 1992.

UNIVERSITY OF TORONTO
TECHNOLOGY FOR ENHANCING LEARNING CENTRE

Title of project: IMPACT OF TECHNOLOGY ON LEARNING MATHEMATICS IN THE TRANSITION YEARS

Person to contact: Robert D. Cook
Head, TEL Centre, Faculty of Education
University of Toronto
371 Bloor Street W.
Toronto, Ontario M5S 2R7, Canada

Tel. 1 415 978 7880 – Fax: 1 416 978 5775

Duration: From September 1990 to June 1994

Funding:
- Centre for Curriculum Resources and Technologies
- Apple Canada and other vendors

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

This is a specific project of the TEL Centre (see previous fact sheet)

Aims:

In two schools, one designed and built anticipating high technology use, the other in transition from traditional educational methods to integration of modern technologies:

- To consider the effectiveness of computer and television technology in the teaching and learning of mathematics.

Implementation:

Approximately fifty students in each of two schools were involved, using high technology in teaching and learning. A third population of students drawn from schools using traditional methodologies will receive instruction in six mathematics topics using a range of technology-based materials and strategies. Student learning will be compared at the end of each school year.

The TEL Centre will support the project by recommending appropriate resources and utilisation strategies, and by planning and delivering teacher development activities in collaboration with the teachers, school principals and Board personnel.

A project advisory committee meets about four times a year to review progress and suggest new directions.

Products:

One of the most eagerly anticipated outcomes from the four-year project will be suggestions for a technology-based mathematics curriculum for the transition years from traditional methods to integration of modern technologies.

Reports annually in September. Final report September 1994.

YORK UNIVERSITY
CENTRE FOR THE STUDY OF COMPUTERS IN EDUCATION

Title of project: THE IMPACT OF COMPUTERS ON STUDENT WRITING

Person to contact: Ronald Owston
Centre for the Study of Computers in Education
Faculty of Education
York University
4700 Keele Street
North York, Ontario, Canada, M3J 1P3
Tel. 1 416 736 5019

Duration: From 1988

Funding:
- York University, Faculty of Education Research Fund
- Apple Canada Education Foundation

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To investigate the benefits of the computer as a writing tool, by comparing the work of one hundred and eleven experienced eighth grade students (lower secondary education), in four communications arts classes, working both on and off computers.

Implementation:

Pupils had been using computers for the writing component of their classes for a year and a half with four 40 minute periods in a six day cycle in a computer room (one Apple IIGS for each student). By the time the study began, they had made the transition from revising drafts by hand and then copying them into the computer, to composing and editing directly on the computer.

Products:

A technical report, in May 1990: "On and Off Computer Writing of Eighth Grade Students Experienced in Word Processing", concludes that the computer written work was significantly better in overall quality and on the competency and mechanics subscales of the Scale for the Evaluation of Narrative Writing (R.D. Owston, S. Murphy and H.H. Wideman).

A follow-up three-year study (1990-1993), financed by the Ontario Ministry of Education, was therefore started in two schools (primary and lower secondary education). It aims at contributing to the formulation of school board policy in the use of word processing in the language arts curriculum.

Denmark

Royal Danish School of Educational Studies (6)
Jelling Teacher Training College

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
DEPARTMENT OF DANISH LANGUAGE AND LITERATURE

Title of project: PRODATA: WORD PROCESSING AND THE WRITING PROCESS IN THE FIRST STAGES OF PRIMARY SCHOOL

Person to contact: Elisabeth Hansen
Department of Danish Language and Literature
Royal Danish School of Educational Studies
Emdrupvej 101
2400 - Copenhagen NV, Denmark
Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: From August 1988 to June 1990 (possibly 1992)

Funding: The Ministry of Education.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two primary schools:

- To learn by experience, using word processing, how process-oriented writing can be used in language teaching in Danish mother-tongue;
- To monitor pupils becoming users of word processing;
- To facilitate acquisition by teachers of skills in the use of computers.

Implementation:

Each school class has access to four computers with a simple professional word processing program, in all lessons. The development in their text writing, as well as their reading skills, spelling skills and handwriting is monitored.

Methods and tests were imparted by the researcher, while the pratical pedagogical elaboration was accommodated within the teachers' whole classroom teaching. The researchers observed and participated in the classroom teaching approximately once a week.

A questionnaire distributed to parents, asking for their opinions and attitudes, showed very wide support from them, both for the pedagogical methods and use of word processing in the first stages of elementary school.

Products:

A realisation of the possibility and necessity for a renewal of methods and tools in teaching writing and reading at the early stages in basic education.

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
DEPARTMENT OF FOREIGN LANGUAGES

Title of project: THE USE OF WORD PROCESSING IN ENGLISH COMPOSITION BY INTERMEDIATE STUDENTS - A CONTRIBUTION TO DESCRIPTION AND ANALYSIS OF THE WRITING PROCESS

Person to contact: Erik Poulsen
Department of Foreign Languages
Royal Danish School of Educational Studies
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2400 - Copenhagen NV, Denmark
Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: From April 1986 to June 1991

Funding:
- Department of Foreign Languages,
- National Innovative Centre for General Education.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In foreign language teaching (English and German) in five schools, lower secondary:

- To describe and analyse word processing integrated into the students' writing of school compositions using a process-oriented approach. More specifically, the study concentrates on three aspects:
  1. A description and analysis of the writing process;
  2. An analysis of what constitutes important instructional, organisational and administrative conditions when integrating word processing into teaching;
  3. An evaluation of the usefulness of a "spelling checker".

Implementation:

The project has been divided into three main phases: a pilot project (1986/87) involving two teachers and forty-eight students, a main phase (1987/88 and 1988/89) involving three teachers and sixty-five students and an implementation phase (1989/90 and 1990/91). The last phase is a follow-up, planned as developmental work in English and German, involving ten teachers of English and five of German and one hundred and seventy-eight students. Regular meetings were held with the National Innovative Centre for General Education. Limited participating observation was carried out by the researcher.

A two-year study group was organised at the University.

Products:

Published articles "Interim reports". Final report 1993..

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
THE GEOGRAPHICAL INSTITUTE

Title of project: INTEGRATION OF ELECTRONIC DATA PROCESSING IN SCHOOL SUBJECTS

Person to contact: Tonny Hübe
The Geographical Institute
Royal Danish School of Educational Studies
Danmarks Laererhojskole
Emdrupvej 101
2400 - Copenhagen NV, Denmark

Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: From August 1989 to July 1990

Funding:
- The Primary School Development Board
- The Experimental Department of the Copenhagen Municipal Educational Board

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a Danish and a German lower secondary school:

To show the ways in which the use of the information technology can contribute to:

- Increased insight into social conditions at home and abroad;
- Strengthening interest for and skill in the use of foreign languages (in this case, German);
- Increased international understanding.

Implementation:

Education work in the German and Danish schools took place simultaneously.

Professional computer application programs were used as tools in co-operation with traditional teaching tools. Data base and archives are used as sources on-line with traditional sources.

The researcher acted as adviser for both schools, established a framework for mutual educational progress, and prepared the bulk of the educational materials. A meeting of teachers from both countries was held. An interdisciplinary project group for evaluation of the school projects in integration of electronic data processing was established.

Products:

Final report December 1990.

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
INFORMATICS IN SCHOOL SUBJECTS

Title of project: INFA: SCHOOLS IN NETWORK

Person to contact: Allan C. Malmberg
Informatics in School Subjects
Royal Danish School of Education Studies
Emdrupvej 115B
2400 - Copenhagen NV, Denmark
Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: Ongoing from August 1989

Funding: Financed nationally

Associated Universities:
- Toronto Board of Education
- Manchester Polytechnic, United Kingdom
- City University of New York, United States
- University of Amsterdam, The Netherlands

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In fifty schools, primary to upper secondary, in a number of countries (Denmark, Canada, Germany, Iceland, Netherlands, Spain, United Kingdom, United States):

- To study the pedagogical prospects for the use of telematics (E-mail) in education;
- To illustrate the extent to which this simple distant education system is effective.

Implementation:

The area of interest is not the use of databases, but communication between persons or groups of persons, including communication across frontiers. Participants need an ordinary PC. They communicate through the European Academic Research Network (EARN). The project developed a number of user facilities that make distance education as simple as possible to teachers as well as students. A userfriendly system was devised by means of menus and specially designed message systems. In practical terms, co-operation is organised by means of a network of co-ordinators at regional universities and teaching and public institutions in Europe, the United States and Canada.

The project has been used in a continuing education course in mathematics for teachers. The course content was topics within statistics and probability, and the material was organised in twenty lectures (120 hours of work). Various communication projects for students have been developed, among them: communicatrion with Iceland and England, communication with handicapped students, and communication in American culture and mathematics.

New schools are continually joining the project.

Products:

The results of the research in using E-mail in the teaching of language will no doubt have an effect on the revision of the curriculum for integrating IT in the teaching of foreign languages.

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
INSTITUTE OF INFORMATICS

Title of project: COMPUTERS IN PRIMARY SCHOOL

Person to contact: Leif Gredsted
Institute of Informatics
Royal Danish School of Educational Studies
Emdrupvej 115B
2400 - Copenhagen NV, Denmark
Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: From January 1989 to December 1991

Funding:
- Institute of Informatics
- Local school authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two schools, pre-primary and primary:

- To investigate the use of computers as a pedagogical tool;
- To describe types of computer programs suited to supporting interdisciplinary teaching in the first grades, and how these programs should be designed to correspond to the level of development of the children;
- To investigate the ability of children aged 6-8 to learn and use application programs that are fundamentally different from computer games.

Implementation:

Design, implementation and observation of classroom use of computer programs is an essential part of the project. The programs are designed to support the childrens' usual working methods and the topics normally taught at this level.

The first period of classroom observation took place in autumn 1990. The intention was to observe the childrens' work with the first specially designed computer program, which is a drawing and writing program, permitting them to make "drawing stories" or cartoons.

Products:

Reports containing accounts of teachers' experiences, lesson plans and teaching materials, for use in in-service teacher training.

ROYAL DANISH SCHOOL OF EDUCATIONAL STUDIES
INSTITUTE OF INFORMATICS

Title of project: THE CRITIQUING PROJECT - APPLYING SECOND GENERATION EXPERT SYSTEMS IN EDUCATION

Person to contact: Bent B. Andersen
Institute of Informatics
Royal Danish School of Educational Studies
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2400 - Copenhagen NV, Denmark
Tel. 45 31 69 66 33 – Fax: 45 39 66 00 81

Duration: From August 1988 to July 1991

Funding:
- Institute of Informatics
- Local School authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In twenty schools, primary and lower secondary, in social science, biology, Danish mother-tongue and informatics:

- To investigate the use of critiquing systems in education.

Implementation:

Critiquing systems are second generation expert systems used to criticise student's problem solving abilities by showing them their mistakes and offering suggestions, improvements and alternatives. The research strategy is to implement prototype critiquing systems and to study their pedagogical uses. Students play an active role in proposing solutions to problems. The system provides feedback for them to evaluate and redefine solutions. Students thereby become responsible for their own learning.

Some teachers are instructed as part of in-service teacher training courses. Others are instructed at meetings in their school district.

The teachers and the researcher meet regularly. The researcher participates to some extent in classroom activities.

New schools will join the project in the future.

Products:

A report on the work so far is given in: Bent B. Andersen "*Applying Second Generation Expert Systems in Education – The Critiquing Approach*". In *Computers in Education:* A. McDougall and C. Dowling (Editors). Elsevier Science Publishers B.V. (North Holland), 1990.

Reports on the project will be sent to education policy-makers.

JELLING TEACHER TRAINING COLLEGE

Title of project: EXPERIMENTS IN THE USE OF TELECOMMUNICATION AS A TEACHING METHOD IN TEACHER TRAINING

Person to contact: Per Pjengaard
Jelling Teacher Training College
Vejlevej 2
7300 - Jelling, Denmark

Tel. 45 75 87 16 00

Duration: From March 1986 to February 1989

Funding:
- Wideband Communication, Vejle
- Vejle Municipality
- The Royal Danish School of Educational Studies
- The Danish Ministry of Education
- The Jutland Telephone Company

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To experiment with telecommunication (two way sound and picture communication) as a teaching method in teacher training. Two schools at primary and lower secondary level of education have been selected for the experiment.

Implementation:

The video equipment enables Jelling Teacher Training College to follow the teaching of the student teacher, practice teacher and lecturers from the training college.

Three types of videoconferences have been used:

Type 1. Direct broadcast of a lesson from the school classroom to Jelling College, where one or two lecturers follow the teaching. Following the video-conference, discussion of the lesson.

Type 2. Videoconference, discussion of selected events from a lesson on tape.

Type 3. Videoconference of several taped lessons. Different situations and themes are discussed; for instance, how are groups formed in the class?

Products:

In terms of improving teacher training, these experiments of videoconferences have shown that a closer connection has been established between the theoretical part of the training at Jelling College and the practical part at the schools.

Finland

University of Helsinki
University of Lapland
University of Jyväskylä

UNIVERSITY OF HELSINKI
DEPARTMENT OF EDUCATION

Title of project: MICROCOMPUTER–A TOOL FOR INSTRUCTIONAL DEVELOPMENT

Person to contact: Leino Jarkko
Department of Education
University of Helsinki
00120 - Helsinki, Finland
Tel. 358 0 1911 – Fax 656 591

Duration: From January 1986 to May 1991

Funding:
- Local Education Authorities
- SITRA (Finnish Independence Jubileum Fond)
- National School Board

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary, one lower and one upper secondary schools:

- To develop, with the aid of the computer, a means of instruction which will emphasize active learning and student-centred and project-oriented studies.

Implementation:

The focus of the project was on making subject matter more interesting and relevant to pupils, and on evolving a more co-operative role for the teacher, i.e. as planner and supporter, rather than information-presenter.

The method used was action-research. Teachers worked together in small groups to develop and evaluate projects in their subjects, for use with computers in their classrooms. They also planned the in-service education they needed to carry out these plans. In this way, teachers' in-service education has been implemented throughout the duration of the project. A new computerised assessment system was devised in which students basic skills (reading, writing, etc.) and general behaviour are assessed.

The researcher organised general lectures about the project and wrote the annual reports.

Products:

Annual reports. Final report September 1991.

UNIVERSITY OF LAPLAND
DEPARTMENT OF EDUCATION

Title of project: TUKU PROJECT: COMPUTERS, A NEW DIMENSION IN EDUCATION

Person to contact: Kurtakko Kyösti
Department of Education
University of Lapland
Post Box 122
96101 - Rovaniemi, Finland
Tel. 358 603 24414 – Fax: 358 603 24401

Duration: From August 1987 to December 1989

Funding: Regional Government of Lapland

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In four primary and two lower secondary schools located in rural districts of Lapland (50 teachers and about 600 pupils):

- To develop in the schools practices which make use of computers as aids in teaching and study;
- To change the method of instruction by strengthening and increasing experiential and practical learning and enhancing the role of the pupils in choosing the subjects and themes studied;
- To encourage schools to develop new methods of working, particularly projectwork.

Implementation:

The project is being carried out as pedagogical-analytical action research. The schools engage in "product development", which in turn contributes to teacher competence and student readiness to function under constantly-changing circumstances. The teachers and pupils work together on some subject or theme, making use of computers where these are pertinent tools. Students and teachers together draw lessons from these experiences (conceptual control of reality, professional and community skills) and new themes for study are thought up and worked out.

Meetings are held two or three times a year with teachers, regional and local authorities and the researcher.

Products:

Final reports (Reports B.13 and B.14 of Lapland University) in 1990.

UNIVERSITY OF JYVASKYLA
INSTITUTE FOR EDUCATIONAL RESEARCH

Title of project: THE COMPUTER AS TOOL IN SCHOOL WORK

Person to contact: Raimo Konttinen
Institute for Educational Research
University of Jyväskylä
Seminaarinkatu 15,
40100 - Jyväskylä, Finland

Tel. 35 841 603 231 – Fax: 35 841 603 201

Duration: From 1986 to 1987

Funding:
- SITRA (Finnish Independence Jubileum Fond)
- City of Kauniainen
- Institute for Educational Research

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To study instructional uses of tool programmes, i.e word processing, database management, spreadsheet, drawing, music composition and telecommunications and their integration by teachers in primary and secondary school work;
- To achieve pupil literacy in information technology by using these tools.

Implementation:

Four studies were undertaken:

Study I: *Uses of computer as tools in school work.* Some 300 pupils and 30 teachers of secondary education were involved.

Study II: *An integrated approach to computer literacy instruction in comprehensive schools .* Two schools, six classes and three teachers participated in the study.

Study III: *Computer literacy of teachers.* An experiment to find out how teachers having little previous experience in computers learn to integrate the use of tool programmes with the rest of their instruction.

Study IV: *Project studies in teacher training.* A "Project study model" was developed to design and investigate a teacher training programme that would combine instruction in the didactics and educational use of computers to the teachers' own subject areas. This is based upon the experiences of the previous studies and on action and

Products:

The Finnish National Board of Schools has adopted the Project study model and implemented it in several "Developmental Schools".

France

University of Aix-Marseille II
University of Bordeaux I
University of Maine
University of Nancy I (2)
University of Nantes
Conservatoire National des Arts et Métiers, Paris
University of Paris-Nord
University of Paris XI

UNIVERSITY OF AIX-MARSEILLE II
UNIVERSITY INSTITUTE OF TECHNOLOGY (IUT)
DEPARTMENT OF COMPUTER SCIENCE

Title of project: THE COMPUTER AS A VEHICLE FOR DEVELOPING READING SKILLS (LOVELY)

Person to contact: Daniel Feneuille
Department of Computer Science
IUT d'Aix en Provence
Avenue Gaston Berger
13625 - Aix en Provence Cedex 01, France
Tel. 33 42 26 57 23 – Fax: 33 42 26 68 73

Duration: From November 1988 to October 1991

Funding:
- The Schools Directorate at the Ministry of Education
- Department of Computer Science at the IUT
- Local Authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To test software packages for the development of reading skills in children in pre-primary, primary and special primary education (basic learning Cycle II, 5-8 year olds) in ten schools (région Provence - Alpes - Côte d'Azur).

Implementation:

This software had been designed with the help of primary teachers and specialists in cognitive sciences and education sciences. Steering clear of the controversy surrounding the merits of different teaching methods, they are aimed at placing the learner as soon as possible in reading situations where he or she is obliged to develop adult reading habits (i.e. not reading aloud).

Products:

Some 40 programs that could be used on compatible PCs were produced, some using speech synthesis or a videodisk. The diskettes are regularly updated.

Information is conveyed between the schools and the university by means of a news bulletin.

UNIVERSITY OF BORDEAUX I
INSTITUTE OF TEACHER TRAINING

Title of projet: A COMPUTERIZED PEDAGOGIC ENVIRONMENT

Person to contact: Claude Bizan
Director, Institute of Teacher Training
Centre for Didactics of Science and Technology
Université de Bordeaux I
33405 - Talence Cedex, France
Tel. 33 56 80 84 50 – Fax: 33 56 80 08

Duration: Ongoing from 1985

Funding: University of Bordeaux I

Associated Universities None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In lower secondary education (age 12 years):

- To study how the use of new information technologies affects the acquisition of knowledge by students, and also how it operates as an aid to learning;
- To analyse the pedagogical results of the project, and to produce software.

Implementation:

The research team is made up of a multidisciplinary group of teachers from the school (mathematics, biology, history, English, French), and the researchers. The methodology consists of:

1. Préparation of classes.
2. Observation of the classes in progress.
3. Analysis and evaluation of the observations made.
4. Publication of summary accounts of the results.

Another project was started in 1991 with another school in the Gironde.

Products:

Various publications and a contribution to internatioal seminars in Sofia, Bulgaria, May 1987 on Education and information Technologies: *"Computers for reading and writing"*; in Rabat, Marocco, February 1989 on: *Informatique et pédagogie*; in Montreal, Canada, May 1990, on L'usage du traitement de texte à des fins pédagogiques.

A Newsletter is published to transmit information bertween the schools and the University.

UNIVERSITY OF MAINE
COMPUTER SCIENCE LABORATORY

Title of project: RESEARCH ON THE USE OF EDUCATIONAL TECHNOLOGIES

Person to contact: Martial Vivet
Computer Science Laboratory
Faculty of Sciences
Université du Maine
BP 535
72017 - Le Mans Cedex, France
Tel. 33 43 83 32 11 – Fax: 33 43 83 33 66

Duration: Ongoing

Funding:
- Pays de Loire Region
- Ministry of Education
- Centre National de la Recherche Scientifique

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To study the contribution of new technologies to education and training in colleges (lower secondary) and a technical lycée.

Implementation:

The field of education that has been selected is *technology: electronics and mechanical engineering* in the case of the colleges and *robotics* in the case of the lycées. In the case of the colleges the emphasis is on the development of "educational micro-robotics". The teachers act as advisers on the educational content and the researchers concentrate on the hardware and software required.

Products:

Relating to micro-robotics as a learning environment and to artificial intelligence, e.g. the man/machine interface in natural language.

UNIVERSITY OF NANCY I
COMPUTER SCIENCE RESEARCH CENTRE OF NANCY

Title of project: SUITABLE USES FOR THE COMPUTER IN EDUCATION

Person to contact: Monique Grandbastien
Computer Science Research Centre of Nancy
Campus Scientifique
Université de Nancy I
BP 239
54506 - Vandoeuvre Cedex, France
Tel. 33 83 91 21 23 – Fax: 33 83 41 30 79

Duration: October 1986 to 1989

Funding: Ministry of Education

Associated Universities: University of Nancy II

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In secondary schools:

- In phase one, to identify particularly suitable uses for the computer in each subject matter; to define, test, modify as necessary and distribute the corresponding courseware;
- In phase two (ongoing), to identify suitable situations for the autonomous use of the computer.

Implementation:

The project consists of a combination of "research-action" programmes, all carried out by secondary teachers under the supervision of a member of the university faculty specialising in educational applications of computers. The courseware that is produced is tested out in the different types of secondary school (lower, upper and technical).

Products:

Material for the training of teachers and eight booklets in a series written for this purpose ("Fenêtre Active", Centre Régional de Documentation Pédagogique de Nancy).

UNIVERSITY OF NANCY I
COMPUTER SCIENCE RESEARCH CENTRE OF NANCY

Title of project: ARTIFICIAL INTELLIGENCE AND THE TEACHING OF QUANTITATIVE CHEMISTRY

Person to contact: Monique Grandbastien
Computer Science Research Centre of Nancy
Campus Scientifique
Université de Nancy I
BP 239
54506 - Vandoeuvre Cedex, France
Tel. 33 83 91 21 23 – Fax: 33 83 41 30 79

Duration: Ongoing from 1989

Funding:
- Centre National pour la Recherche Scientifique
- Institut National pour la Recherche Pédagogique

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In an upper secondary lycée (16-17 year-olds):

- To investigate to what extent graphic representations of certain concepts in quantitative chemistry can be of assistance in the teaching environment, i.e. the current textbook-based environment.

Implementation:

This involves supplying a graphics generator which operates in such a way that the diagrams displayed are constructed in accordance with the problem posed rather than being extracted from a static, pre-established library.

The teachers specify their requirements and the university researchers come up with a model to satisfy these. This model has then to be incorporated into the chemistry teachers' software (providing this can be done on the workstations they have) and tried out in their classrooms.

Products:

An intelligent tutoring system.

UNIVERSITY OF NANTES
EDUCATIONAL RESEARCH CENTRE

Title of project: THE USE OF NEW TECHNOLOGIES FOR INFORMATION AND TRAINING PURPOSES

Person to contact: Luc Guen
Computer Science Division
Educational Research Centre
Université de Nantes
Chemin de la Sensive du Tertre, B.P. 1025
44036 - Nantes cedex 01, France

Tel. 33 40 74 01 11 – Fax: 33 40 37 92 33

Duration: From September 1988 to September 1990

Funding:
- Hardware, by the Chamber of Commerce and Industry in Nantes
- Software, by the Mission Académique à la Formation des Personnels de l'Education Nationale (MAFPEN)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To use a documentation databank in a lycée (upper secondary technical) as an educational tool both in general education and in vocational training for the services sector.

Implementation:

The "Vialdoc" database was set up on one of the lycée's mini-computers. Peripherals (minitels and terminals) throughout the lycée and in various other locations (other lycées and the Documentation Centre of the Chamber of Commerce) are connected to this. Students are able to perform real tasks by entering new information of various kinds into the databank in the form of summaries and descriptors to help users locate bibliographical references.

Products:

This operation of inputing information means that the students, without its being necessary to pressure them into doing so, read the literature covering their fields of study and then summarise this, which calls for both preciseness and conciseness. It also enables them to acquire a good practical knowledge of computer operations.

Final report available mid-1991.

CONSERVATOIRE NATIONAL DES ARTS ET METIERS, PARIS
CENTRE FOR RESEARCH AND EXPERIMENTATION IN THE TEACHING OF MATHEMATICS

Title of project: MATHEMATICS WITH SOFTWARE GRAPHICS

Person to contact: Jérôme Chastenet de Géry
Director, CREEM
Conservatoire National des Arts et Métiers
292 rue Saint Martin
75141 - Paris cedex 03, France
Tel. 1 40 27 22 94 – Fax: 1 40 27 27 46

Duration: From 1986 to 1991

Funding:
- Conservatoire National des Arts et Métiers
- Ministry of Education, Directorate for Upper and Lower Secondary Education
- Copyrights

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In seven lycées (upper secondary) and a number of other schools:

- To design and create a set of programs to illustrate in the form of interactive software graphics the entire mathematics curriculum for one grade in upper secondary education.

Implementation

The grade chosen was 2nd grade (15-16 year olds) in view of its pivotal role as the first grade in upper secondary education and the last grade of non-specialisation. The programmes are not used for *individual tuition* but for *collective* instruction by the teacher in the classroom, conversing with his microcomputer and his students who interact with the graphics on the videoscreens in the classroom (some of this software can also be used individually).

The CNAM and the schools co-operated in the designing, creation, testing and planning of this software from an educational standpoint.

Products:

A Mathematics Manual for the 2nd grade with illustrations in the form of software graphics "Images Logicielles" (Hachette, Publisher). An information and training brochure for teachers, which will be distributed by the Centre National de Documentation Pédagogique.

Final report due in 1991.

UNIVERSITY OF PARIS-NORD
DEPARTMENT OF EDUCATIONAL SCIENCES

Title of project: THE USE OF NEW INFORMATION TECHNOLOGIES IN TEACHING YOUNG CHILDREN TO READ AND WRITE

Person to contact: Rachel Cohen
Department of Educational Sciences
Université de Paris-Nord
Avenue J.B. Clément
93430 - Villetaneuse, France

Tel. 33 49 40 30 00 – Fax: 33 49 40 33 33

Duration: From 1983 to June 1992

Funding:
- Ministry of Education
- University of Paris-Nord

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a number of nursery and primary schools in the Seine-Saint Denis area:

- To use new information technologies to teach reading and writing to young children, whether these be non French-speaking, illiterate, hearing impaired or suffering from serious behavioural disorders.

Implementation:

The technology used in the schools consists of a microcomputer equipped with a speech synthesizer. The operation takes the form of a research-action-training project in which all of the participants (teachers and university researchers) play an equal part. The research objectives, the working hypotheses and the way the class is organised are defined jointly by the team as the operation progresses. Video recordings of classroom situations are analysed by the team in order to determine which are the more effective approaches.

Products:

Report in December 1990.

UNIVERSITY OF PARIS XI
COMPUTER SCIENCE RESEARCH LABORATORY

Title of project: APLUSIX

Person to contact: Jean-François Nicaud
Computer Science Research Laboratory
Université de Paris XI
Bâtiment 490
91405 - Orsay Cedex, France
Tel. 33 69 41 67 50

Duration: Launched in 1983

Funding:
- Co-ordinated research programme of the Centre National de la Recherche Scientifique en Intelligence Artificielle
- Contribution from Apple
- PIRTTEM Research Programme of the Centre National de la Recherche Scientifique

Associated Universities:
- University of Paris VI (Computer Sciences)
- University of Paris VIII (Cognitive Psychology)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

With the help of two teachers from a lycée (upper secondary education):

- To design and produce educational software for a part of the algebra syllabus and analyse the teaching/learning process therein. Its likely outcomes are the extension of the field (the solving of polynomial equations, the study of functions), the modelling of the student and the development of a tutoring module to direct the learning process.

Implementation:

APLUSIX, which is a highly interactive learning environment, enables the student to concentrate on aspects other than pure computation. It has two learning modes: *learning by doing* (the student does the calculations by selecting the expression to be transformed and the transformation to be applied) and *learning by example* (the student looks at standard solutions. The program which uses a concept of an "ideal student" whose knowledge needs to be completed, will, if required, explain an operation and the reasons for which it was used).

Products:

The present version is a prototype which is undergoing tests and protocol analysis in respect of the factoring of polynomials.

Germany

University of Dortmund (2)
University of Kiel
Bavarian Institute for Pedagogy and Educational Research, Munich
University of Oldenberg

UNIVERSITY OF DORTMUND
CENTRE FOR DIDACTICS IN HIGHER EDUCATION

Title of project: NEW INFORMATION TECHNOLOGIES AND BASIC COMPUTER LEARNING IN SECONDARY EDUCATION

Person to contact: Rolf v. Lüde
Centre for Didactics in Higher Education
University of Dortmund
Rheinlanddamm 199
4600 - Dortmund 1, Germany

Duration: Ongoing from 1986

Funding: Centre for Didactics in Higher Education, University of Dortmund

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In lower and upper secondary education (co-operation is not with specific schools, but with teachers and teacher trainers):

- To establish a computer educational system;
- To prepare students in the use of computers in their working life.

Implementation:

The project was conceived to fill two gaps: to accelerate in Germany the development of computer based education; to enable students and future employees to understand computer use in industry and society and to be capable of influencing its direction.

The project trains teachers and teacher trainers in secondary education. The organisers feel that in basic secondary computer education, the emphasis must be on an understanding of different kinds of user software and - even more important - detecting the opportunities and the risks of computer application in production and society. Given that 95 per cent of future employees will not be using programming techniques, emphasis is on application programs and software.

A 3 day training course is held three times per semester.

The project is orientated at the new Information Technology curriculum of the "Land Nordrhein-Westfalen".

Products:

Two publications: *"Filling the Educational Computer Gap: Computer Learning in Secondary Education in West Germany"*, by Rolf v. Lüde, University of Dortmund; and *"Mit dem Computer leben"*, by Rolf v. Lüde and Hans-Günter Rolff, Haaran, Frankfurt am Main/Salzburg, 1989.

UNIVERSITY OF DORTMUND
DEPARTMENT OF PEDAGOGY

Title of project:	COMPUTER APPLICATION IN PRIMARY SCHOOLS
Person to contact:	Karl A. Wiederhold Department of Pedagogy Institute for Education and General Didactics University of Dortmund Postfach 50 05 00 4600 - Dortmund 50, Germany
Duration:	From Autumn 1985 to December 1988
Funding:	– Ministry of Education of North-Rhine Westphalia – Federal Ministry of Education and Sciences
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In four schools in primary education:

- To research a methodological approach to a quality oriented study on computer applications;
- To gain insight into the possibilities and perspectives of a sound computer application in primary schools.

Implementation:

Each school has a specific research focus:

- Computer lessons in class and in work groups (three classes);
- Computers in free work time and in week-plan timetable (one class);
- Partner work with chosen drill and practice software in chosen fields (one class).

The project looked at the applications of computers for: learning processes; gender; appropriate use of computers; development of programs and simulations; adventure games. The equipment used was Apple, Atari or Commodore.

Members of the research group were pupils, teachers students and researchers.

A report on the results of the research was carried out on the attitudes of pupils, teachers and parents. It includes recommendations about the types of hardware and software to be chosen at primary level of education and further research to be undertaken.

Products:

A publication: *"Computers in Primary Teaching: Possibilities and Educational Perspectives"*, H. Mitzlaff, K.A. Wiederhold, Hamburg 1990.

UNIVERSITY OF KIEL
INSTITUTE FOR SCIENCE EDUCATION

Title of project: USING THE COMPUTER IN SPECIAL EDUCATION (COMPASS)

Person to contact: Uwe Hameyer
Institute for Science Education
University of Kiel
Olshausenstr. 62
2300 - Kiel 1, Germany

Tel. 37 431 880 40 58 – Fax: 37 431 880 15 21

Duration: From June 1986 to June 1990

Funding:
- Federal Ministry of Education and Science
- Ministry of Education in Kiel
- Institute for Science Education at Kiel University
- Two Foundations

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In lower secondary and special education schools, involving more than 110 teachers:

- To investigate the use of computers as a teaching and learning aid as well as a component of new technology education, with emphasis on special and pre-vocational training.

Implementation:

During the implementation, a tested program for Basic Information Technology Education (the Federal/Länder policy for introducing information technology in education) consisting of four sections was prepared:

- *Introductory Section.* Hardware, software;
- *Application section.* Word Processing, data base, spreadsheets, graphics;
- *Follow-up section.* Newspaper, comic story, group portrait, yearly calendar;
- *Basic information section.* Development and prognoses, abundant Information, effects on careers and society, computers and data protection.

Products:

The results are documented in a final report (1989) and a series of four issues about COMPASS.

BAVARIAN INSTITUTE FOR PEDAGOGY AND EDUCATIONAL RESEARCH

Title of project: ADVANCED COURSE IN INFORMATION SCIENCE AND DATA PROCESSING

Person to contact: Alto Merkt
Bavarian Institute for Pedagogy and
Educational Research
Arabellastr. 1
8000 - Munchen 81, Germany

Duration: From 1989 to 1991

Funding:
- Bavarian Ministry for Teaching and Culture, Science and Arts
- 88 Districts in Bavaria

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In all schools for handicapped children in Bavaria (main classes 8-9):

- To train teachers in the use of new information technologies.

Implementation:

It is compulsory in schools for handicapped children in Bavaria to have at least one teacher trained for a minimum of ten days in the use of the new information technologies. About 250 teachers will be trained between 1989 and 1992. A group of thirty-three local advisers were trained to deliver the course. Training is general and not related to particular pedagogics.

This project is linked to the Institute for In-service Training for Teachers and the Central Institute for Computers in Education in Bavaria.

Products:

A book about the use of computers in primary classes for handicapped children.

UNIVERSITY OF OLDENBURG
DEPARTMENT OF INFORMATICS

Title of project: PROJECT TO LINK UNIVERSITIES AND TEACHING ORGANISATIONS (PLUTO)

Person to contact: Peter Gorny
Department of Informatics
University of Oldenburg
Postfach 2503
2900 - Oldenburg, Germany
Tel. 37 441 798 29 01 – Fax: 37 441 798 2155

Duration: From September 1990 to August 1992

Funding:
- COMETT II (Commission of the European Communities Project)
- Private Enterprise

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

PLUTO is a European education, industry and government project, the aim of which is to raise the level of information technology literacy and language skills in teacher training, schools and industry through practical networking. Manchester Polytechnic is the organiser of the Project, which links the University of Vienna, Austria; the Free University of Brussels, Belgium; the University of Oldenburg, Germany; the University of Patras, Greece and the University of Falun-Borlange, Sweden.

Aims:

In one lower secondary, two lower and upper secondary and one vocational school:

- To enhance new information technology training in Europe via co-operation based on the use of the electronic network EARN (European Academic and Research Network).

Implementation:

The skills covered range from those in which some expertise exists already but where there is need for enhancement (e.g. database and spreadsheet up to the level of structured Query language) to areas in which the experience base is virtually nil (use of hypermedia). The project will engage in the preparation of support for training in all of these areas, while additionally developing the use of networking as a modality for collaboration.

Products:

Published training strategies; published support materials, including manuals and videos (minimum of five); identification and dissemination of specifications for futher development, based on analysis of user and group needs; electronic publication of a Newsletter to disseminate information about project development; paper publication of a series of reports on project achievements.

Final report 1994.

Ireland

University College, Dublin
St. Patrick's College, Dublin
University of Limerick (2)

UNIVERSITY COLLEGE, DUBLIN
COMPUTING SERVICES AND DEPARTMENT OF EDUCATION

Title of project: COMMUNICATIONS SKILLS USING A WIDE-AREA COMPUTER NETWORK

Person to contact: Aine Hyland, Department of Education
Mike Norris, Computing Services
University College, Dublin
Dublin 4, Ireland

Tel. 353 1 693244 – Ext. 8519

Duration: From October 1989 to June 1991

Funding:
- Computing Services of the University College
- Dalkey National School Parent Teacher Association

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To introduce children of a primary school (8 grades, from four years of age upwards) to the use of computer technology as a tool to be used un conjunction with their school work.
- To prototype the use of wide area networks as a means of communicating and engaging in collaborative projects with peer groups in other parts of Europe and of the world.

Implementation:

Childrens use two computers and they have access with a modem to the EARN/BITNET network. Through correspondence between the children and those in schools throughout the English-speaking world, they can share their ideas and stories.

Products:

Pupils have developed word-processing and writing skills as a result of this Project and have built up friendships with children in other parts of the world.

Final report in September 1991.

St. PATRICK'S COLLEGE, DUBLIN
EDUCATION DEPARTMENT

Title of project: LOGO ENRICHMENT FOR MATHEMATICALLY ABLE CHILDREN

Person to contact: Sean Close
Education Department
St. Patrick's College
Drumcondra
Dublin 9, Ireland
Tel. 353 1 376191 – Fax: 353 1 376 191

Duration: From January 1985

Funding: St. Patrick's College, Dublin

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To enhance and extend the mathematical knowledge of children and raise the level of their problem-solving skills;
- To develop self-motivation and self-reliance in children;
- To develop and test course materials and teaching strategies for using LOGO as a tool for learning.

Implementation:

From a number of schools distributed around the country, pupils in the age range 8 to 14 years are selected for extra-curricular courses (25 hour blocks on Saturdays/evening/summer vacations) on the basis of their performance on the Raven's Progressive Matrices and the Drumcondra Mathematics Tests. Each year, about 300 able children participate in the courses.

The tutors are primary and secondary teachers who are interested in using LOGO as a tool for learning. A variety of LOGO microworlds are used to provide problem-solving experience for the pupils.

Pretest - Post-test studies have been carried out to assess the impact of the course on pupils mathematical knowledge. Video-tapes have been made of some the children while they are solving problems and they have been used to analyse the problem-solving behaviour of the children.

Products:

Papers have been published from time to time. Curriculum materials.

UNIVERSITY OF LIMERICK
COLLEGE OF EDUCATION

Title of project: MICROPROCESSORS FOR CONTROL AND MONITORING

Person to contact: John O'Brien
Assistant Dean, College of Education
University of Limerick
Schuman Build.
Limerick, Ireland
(formely, Head of Physics Department
Thomond College of Education)
Tel. 353 61 333 644 – Ext. 5001

Duration: From March 1981 to 1985

Funding: Ministry of Education

Associated Universities:
- University of Limerick
- Regional Technical College, Waterford

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To monitor any developments with regard to this subject component in twenty-eight second level schools.
- To co-ordinate and support such programmes with a view to development.

Implementation:

A Steering Committee has been formed to oversee the project, which includes four teachers already active in the subject area. Material developed will be field tested in the selected schools. Seminars and meetings with teachers will be held to assist in the dissemination of information and project progress.

Products:

Framework for the course to be approved.

UNIVERSITY OF LIMERICK
COLLEGE OF EDUCATION

Title of project: DEVELOPMENT OF HYPERCARD/HYPERPARD STACKS FOR USE IN TEACHING OF TECHNOLOGY

Person to contact: John O'Brien
Assistant Dean, College of Education
University of Limerick
Schuman Build.
Limerick, Ireland
(formely, Head of Physics Department
Thomond College of Education)
Tel. 353 61 333 644 – Ext. 5001

Duration: From November 1990 to December 1991

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To produce specific applications of object-oriented software in the form of hypertext systems for use in the teaching of the new Junior Technology syllabus. Five lower secondary schools are involved in this project.

Implementation:

These systems allow powerful applications to be built which have a very user-friendly interface while at the same time allowing modifications and extensions to be incorporated by the user. There are at least two systems, one running on Apple Mac's (Hypercard) and the other on MSDOS compatible machines (Hyperpad). Applications built on one system are easily translatable to the other.

Products:

The units would be produced by teachers with an initial training in the use of the object-oriented software. On completion of the project, the units would be available for use immediately in schools.

An additional benefit would that a nucleus of expert teachers would then be available to develop further applications and to train other teachers in the use of such systems.

Italy

University of Florence
University of Genoa
University of Macerata
University of Parma (2)
University of Pavia
University of Rome 'La Sapienza'
University of Siena

UNIVERSITY OF FLORENCE
DEPARTMENT OF EDUCATIONAL SCIENCES

Title of project: COMPUTER TECHNOLOGY APPLIED TO THE TEACHING OF LANGUAGES: DEVELOPMENT OF A PROTOTYPE

Person to contact: Lydia Tornatore
Department of Educational Sciences
Faculty of Education
University of Florence
Via Cavour 82
50129 - Florence, Italy
Tel. 39 55 2757 – Ext. 761 or 748

Duration: From 1989 to 1991

Funding: National Council for Research (for the equipment)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a lower secondary school:

– To assess the potential of the computer language "Prolog" in the teaching of languages.

Implementation:

The first phase involved the preparation of a program in Prolog; the students using this will need to define the components of a phrase and a number of rules of syntax so that the computer can use the linguistic models correctly in identifying similar elements in different contexts.

The second phase involves co-operation with the teachers who will be testing the computer environment and helping to adapt this to the context of activity within the classroom.

Products:

A program in Prolog for the teaching of languages. This program will be a follow-up to previous ones in the same area for telewriting and word processing.

UNIVERSITY OF GENOA
DEPARTMENT OF MATHEMATICS

Title of project: INTEGRATION OF COMPUTER SCIENCE AND MATHEMATICS

Person to contact: Fulvia Furinghetti
Department of Mathematics
University of Genoa
Via L.B. Alberti, 4
16132 Genoa, Italy

Tel. 39 10 2099

Duration: Ongoing

Funding:
- National Council for Research
- Ministry of Public Education
- Ministry for Universities and Scientific and Technological Research

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In upper secondary schools (14 to 19 years) of different types (Scientific Lyceum, Technical Institute):

- To integrate the teaching of computer science and mathematics as a part of the renewing of the Italian mathematics curricula at the level concerned.

Implementation:

The project deals with the training and re-training of in-service mathematics teachers in computer science and the use of computer. Special attention is given to the problem of integrating computer science in the mathematics curriculum.

Monthly meetings are held of all the personnel involved.

Products:

Teacher training courses; text-books for students; text-books for teachers.
Description of new mathematics curricula.

UNIVERSITY OF MACERATA
DEPARTMENT OF PHILOSOPHY AND HUMAN SCIENCES

Title of project: NEW INFORMATION TECHNOLOGIES IN SCHOOLS

Person to contact: Anna Arfelli Galli
Department of Philosophy and Human Sciences
University of Macerata
V. Garibaldi 20
62100 Macerata, Italy
Tel. 39 733 230 341 – Fax: 39 733 418 329

Duration: January 1991 to June 1992

Funding: University of Macerata

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one upper secondary school:

- To study the interaction between students and machines: the particularity of communications and learning with the new information technologies.

Implementation:

The teachers in the school will organise learning situations for their students through the use of computers and other educational technology. The work will be video-recorded for discussion by school teachers and researchers.

The project is organised through regular meetings between students and teachers and between teachers and researchers.

Products:

Final Report in Autumn 1992.

UNIVERSITY OF PARMA
FACULTY OF SCIENCES, FACULTY OF ECONOMY

Title of project: REQUALIFYING TEACHERS IN THE USE OF NEW TECHNOLOGIES.

Person to contact: Giovanni Dario Andreetti
Director, Interprovincial Laboratory of Informatics
University of Parma
Viale delle Scienze
43100 - Parma, Italy
Tel. 39 521 2041 – Fax: 39 521 204340

Duration: From January 1987 to December 1989

Funding:
- University of Parma
- Region and Provinces

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In all lower and upper secondary schools in the provinces of Parma (about thirty) and Piacente (about twenty):

- To enable teachers to requalify in the use of new technologies.

Implementation:

The project established a network through radio broadcasting of programs, courseware and exercises and a telephone close-up for question. A regional RAI (Italian Radio) program sent bits through a device constructed in Parma, able to add digital data to the analogical signal of the radio. A normal radio set was used as a modem for the computer input. A total of more than two hundred computers have been involved in the project, reaching not less than six hundred teachers.

In a second project, a telephonic asynchronous network was set up connecting all the secondary schools for: administration duties, bulletin board system, diffusion of tests of public domain programs, evaluation network of commercial programs.

Meetings at policy and decision-making level, once per year. Metings at technical-scientific level 6-7 times per year.

Products:

Final report December 1990.

UNIVERSITY OF PARMA
INSTITUTE OF CHEMISTRY

Title of project: TEACHING CHEMISTRY

Person to contact: Giovanni Dario Andreetti
Institute of Structural Chemistry
University of Parma
Viale delle Scienze
43100 - Parma, Italy
Tel. 39 521 2041 – Fax: 39 521 204340

Duration: From November 1989 to June 1990

Funding:
- University of Parma
- Province

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In upper secondary schools of Parma and in the province of Parma:

- To enable the requalification of chemistry teachers through the use of new information technologies.

Implementation:

The project operates through extensive usage of programs from the SERAPHIM project and other new technology applications, such as videodiscs. It also involves the study of new methods of evaluation and modern techniques of chemical analysis through some training in the laboratory.

All the teachers participated in the writing of the final report.

Products:

Final report July 1990

UNIVERSITY OF PAVIA
UNIT OF COMPUTER ASSISTED LEARNING

Title of project: THE COMPASS PROJECT

Person to contact: F. Bertè
Unit of Computer Assisted Learning
University of Pavia
27100 - Pavia, Italy
Tel. 39 382 35491 - Fax: 39 382 21389

Duration: Ongoing from 1987

Funding:
- Regional Authority
- University of Pavia

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In all the lower and upper secondary schools, whether state-run or private, in the Province of Pavia:

- To develop a successful teacher training model for computer assisted learning.

Implementation:

The Compass project may be defined as an example of an alternative to the "cascade" model (long courses for selected teachers who teach their colleagues on their return to schools) which has evolved self-training techniques for groups of teachers. All teachers, working in groups, are required to construct computerised teaching units as part of their training. The teachers have set up a co-ordinating committee which sets out the objectives that are to be achieved. Guidelines are suggested by the research team to the teachers' committee.

The University has no teaching role whatsoever in the project. It places software and hardware at the disposal of teachers who organise their own teaching. The research team's role is to monitor the success of the model adopted, to measure the quality of learning and above all to carry out field research into teacher training models.

The project operates through seminars for teachers held in the spring over a period of ten weeks.

Products:

Interim reports. Dissemination through publications, questionnaires, conferences and discussions. A book at end 1990/early 1991.

UNIVERSITY OF ROME 'LA SAPIENZA'
DEPARTMENT OF THE PSYCHOLOGY OF DEVELOPMENT

Title of project: Phase 1. LINGUISTIC ABILITIES AND COMPUTER USE
Phase 2. WRITING AND KNOWLEDGE REPRESENTATION THROUGH THE COMPUTER

Person to contact: Clotilde Pontecorvo
Department of the Psychology of Development
Faculty of Educational Sciences
University of Rome "La Sapienza"
Via dei Marsi 78
00185 - Roma, Italy

Duration: Phase 1. From October 1986 to October 1988
Phase 2. From October 1988 to December 1991

Funding:
- National Council for Research
- Ministry of Universities and Research
- Olivetti (hardware equipment)

Associated Universities: University of Florence

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In seven primary and three lower secondary schools:

- *Phase 1.* To investigate the use of a particular language software for developing metalinguistic skills in children;
- *Phase 2.* To develop the practical application of the software.

Implementation:

Phase 1. A metalinguistic courseware has been developed for the project. It involves seven programs aimed at developing different types of "stories" (with more or less restraints), different modes of text composition and ways of analysing syntactical structures. Effects of this courseware on children's text composition and metalinguistic skills have been tested both through individual interviews and analytical observation of peer linguistic interactions.

Phase 2. a) Use of the computer as a desktop publishing tool to produce school/classroom newspapers; b) Use of a word processor to help with childrens' text planning, generating and revising; c) Use of a database as a teaching tool. A possible teaching curriculum is being developed, so that children can examine themselves in the activity of data collection, recording, recover and further elaboration.

Evaluation is carried out by comparing experimental with matched control groups.

Products:

Phase 1. Final report published: A. Pontecorvo, C. Zucchermaglio and R. Taffarel, The Computer as an Educational Tool in Metalinguistics in *"The School Computer and Language"*, Loescher,Torino, 1989, pp.171-231. A. Calvani editor.

Phase 2. Final report March 1992.

UNIVERSITY OF SIENA
DEPARTMENT OF MATHEMATICS

Title of project: INFORMATICS, LOGIC AND THE LEARNING PROCESS

Person to contact: Alfio Andronico
Department of Mathematics
University of Siena
Via del Capitano 15
53100 - Siena, Italy

Duration: Ongoing from December 1987.

Funding:
- Ministry of Public Education
- Ministry for Universities and Scientific and Technological Research

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In three primary and lower secondary schools:

- To study the role of the computer methodology and materials in the teaching and learning processes;
- To study the use new information technologies in schools, in particular to investigate the links between informatics, logical thinking and the learning process.

Implementation:

Particular attention is given to: use of new information technologies in the development of conceptual and logical thinking (inductive and deductive, etc.); the contribution of informatics for the learning of conceptual thinking in various disciplines (language, mathematics, etc.); the potential and the limits of logical programming and its relation to the above two points.

An interactive tutorial system based on LOGO has been established for the didactics of geometrical concepts (isometrics in particular). An important aspect of the project is to integrate research on the processes of learning with the application of the results of the didactic experiments. Relations and analogies with the didactic of various disciplines are studied.

Products:

The definition of a basic system model with the design of an Intelligent Tutoring System is the first step. For further development it is planned to use an Educational Laboratory which integrates VIdeo, Audio and Computer means (VIDAC).

Japan

Gifu University

Joetsu University of Education

Naruto University of Education

Tokyo Gakugei University

Centre for Learning,
Software Resources and Information Research, Tokyo

Tsukuba University

GIFU UNIVERSITY
CENTRE FOR CURRICULUM RESEARCH AND DEVELOPMENT

Title of project: DEVELOPMENT OF COURSEWARE FOR LEARNING AND ESTABLISHMENT OF DATABASES FOR EDUCATIONAL MATERIALS

Person to contact: Tadahiko Gotoh
Centre for Curriculum Research and Development
Faculty of Education
Gifu University
1-1, Yanagito, Gifu-shi
Gifu-ken 501-11, Japan

Duration: Ongoing from 1980

Funding:
- Gifu University
- Kawashima-machi Education Board
- Centre for Development of Learning Information Resources
- Gifu-ken

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For two schools, primary and lower secondary:

- To develop learning courseware;
- To establish a database for educational materials.

Implementation:

The project works through:

- Developing of an Instructional Learning System including individualised learning, (Computer Assisted Instruction);
- Developing of individualised learning materials;
- Developing of the curriculum in computer literacy for students;
- Development of the Kawashima Data Processing System (KDPS), including Computer Managed Instruction;
- Development of an in-service teacher training program for teachers.

Communication between university and schools is established through electronic mail network system.

Products:

Publication of Technical Reports.

JOETSU UNIVERSITY OF EDUCATION
CENTRE FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

Title of project: EDUCATIONAL USES OF COMPUTERS AND DEVELOPMENT OF TRAINING PROGRAMMES FOR TEACHERS

Person to contact: Masatoshi Nambu
Centre for Educational
Research and Development
Joetsu University of Education
7-2, Nishishiro-machi 1-chome, Joetsu-shi,
Niigata-ken 943, Japan

Duration: From April 1985 to March 1993

Funding: Joetsu University of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In primary and lower secondary schools and in Joetsu Audio-visual Library (a non-formal education institution):

To enhance the computer literacy of teachers:

- To appreciate the software and courseware developed in schools;
- To train the leaders of teachers groups in the educational uses of microcomputers.

Implementation:

Training programmes are organised as follows:

- Basic courses for educational uses of microcomputers (3 days);
- Computer programming course (for beginners, and intermediate level, 4 days each);
- Computer assisted learning courseware development course (3 days);
- Dataprocessing course for classroom observation techniques.

The courses include both lecures and hands-on practice. A beginner's course consists of operation of microcomputers: spreadsheet, graphics, sociometry software, and databases. Lectures cover the operating system and structure of the microcomputer system, basic strategies for educational uses of microcomputers and problems and issues of future uses of microcomputers in education. The project is linked to the Municipal Education Board, Joetsu-shi and the Prefectural Education Board, Niigata-ken.

Products:

Computers Uses in Education, Vols. 1 & 2 (published).
Computers Uses in Education, Vols. 3, 4, 5 & 6 (to be published).

NARUTO UNIVERSITY OF EDUCATION
DEPARTMENT OF SCHOOL EDUCATION

Title of project: CO-OPERATIVE PROJECT ON THE PROMOTION OF INFORMATION LITERACY

Person to contact: Fumihiko Shinohara
Department of School Education
Naruto University of Education
Takashima, Naruto-shi,
Tokushima 772, Japan

Duration: From April 1982 to March 1991

Funding:
- Chiyoda-ku Ward Education Authority
- Mitsubishi Electric Co. Ltd.
- Fujitsu Co. Ltd.

Associated Universities:
- Tokyo Gakugei University, Centre for Educational Technology

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one in Tokyo in lower secondary school:

- To develop computer literacy and its dissemination and use:

Implementation:

Researchers from the two universities and staff from Ward Education Authorities discussed the project and came to an agreement on research objectives, organisation, teacher training programme, development and evaluation of courseware and authoring software, and the budget.

The project is designed in accordance with situation of the school, the subject matter, teacher competencies and facilities already installed. 46 microcomputers and 2 printers equip the school.

Once every two weeks, teachers and researchers meet at the school to exchange information and to discuss problems.

Products:

Final Report March 1991

TOKYO GAKUGEI UNIVERSITY
CENTRE FOR EDUCATIONAL TECHNOLOGY

Title of project: DEVELOPMENT OF CAI COURSEWARE AND AUTHORING SYSTEM

Person to contact: Fumihiko Shinohara
Centre for Educational Technology
Tokyo Gakugei University
1-1, Nukuikita-machi 4-chome
Koganei-shi, Tokyo 184, Japan

Duration: From April 1987 to March 1991

Funding: Stratford Computer Centre Co. Ltd.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In Chiba Municipal Education Centre, for primary and lower secondary experimental schools:

- To establish education which is relevant to children's ability and aptitudes;
- To upgrade quality in educational activities and teacher competences;
- To promote information technology literacy for teachers and pupils.

Implementation:

The project is carried out through four objectives:

1. Establishement and development of a hardware system (52 micro-computers, 2 video editing machines, 2 laser disks 2TV Cameras);
2. Development and evaluation of courseware and authoring software;
3. Development and evaluation of a teacher training programme;
4. Application of new information technologies to non-formal education settings.

In order to pursue these objectives, education trainers, staff from the enterprise, teachers from experimental schools and faculty members from the University meet regularly to exchange information (7 times a year).

Products:

Final report March 1991.

CENTRE FOR LEARNING SOFTWARE RESOURCES AND INFORMATION RESEARCH, TOKYO

Title of project: RESEARCH ON EDUCATIONAL USES OF MICROCOMPUTERS

Person to contact: T. Nakagawa
Centre for Learning Software Resources and Information Research
Daikan' yama-Sagwa Building 2F
30-16, Ebisu-nishi 1-chome, Shibuya-ku,
Tokyo 150, Japan

Duration: From 1989 to 1993

Funding:
- Universities
- Schools
- Japan IBM Company Ltd.

Associated Universities:
- Gifu University
- Hokkaido University of Education
- Naruto University of Education
- Tokyo Gakugei University, and
- Tokyo University of Electronics

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For eleven primary and lower secondary schools:

- To develop educational materials and a database system for computer literacy;
- To develop the resources for learning courseware based on the school curriculum;
- To develop instructional methods in educational uses of computers.

Implementation:

The Project is a five-year Plan involving the five universities, the eleven primary and lower secondary schools and the Educational Centres at Prefecture Level. It has been initiated by the Centre for Learning Software Resources and Information Research.

Training textbooks are provided; software and educational materials are developed and tested; research and development of a network system has been carried out. The research group meets five to six times a year. A general assembly is held twice a year.

Products:

A monthly journal entitled *"Learning Resources and Information"* is published.

TSUKUBA UNIVERSITY
CENTRE FOR SCIENTIFIC INFORMATION PROCESSING

Title of project: EDUCATIONAL COMPUTING

Person to contact: Kazuhiko Nakayama
Centre for Scientific Information Processing
Tsukuba University
1-1, Tenno-dai 1-chome, Tsukuba-shi,
Ibaragi-ken 305, Japan

Duration: Ongoing from April 1988

Funding:
- Tsukuba University
- Local Education Boards

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For primary, lower secondary and upper secondary schools, one in Tsukuba-shi and the others all over Japan:

- To develop a frame-type Computer Assisted Instruction system, with software and courseware development;
- To exchange Computer Assisted Instruction courseware developed by school teachers;
- To research and develop transportability of software and courseware between different computer systems;
- To develop an in-service teacher training programme for various types of school teachers.

Implementation:

Training courses are developed with the help of local government, as well as with an enterprise (Sharp Electric Company Ltd.). These courses involve lectures and videos and hands-on practice. The content is a basic introduction to computer assisted learning, courseware design, data input such as tables and graphics, design and development of a guidebook for students and teachers. Trials of the courseware developed are carried out

Some 20 training courses a year are held all over Japan. Over 500 teachers have been trained.

Products:

Teacher training courses.

Luxembourg

University Centre of Luxembourg

UNIVERSITY CENTRE OF LUXEMBOURG
DEPARTMENT OF PEDAGOGIC TRAINING

Title of project: THE USE OF NEW INFORMATION TECHNOLOGIES IN EDUCATION

Person to contact: J.F. Roger Strainchamps
Department of Pedagogic Training
University Centre of Luxembourg
162 A, Avenue de la Faïencerie
1511 - Luxembourg
Tel. 352 2 16 21

Duration: Ongoing

Funding: University Centre of Luxembourg

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To train teachers in the use of the new information technologies in teaching vocabulary, in desktop publishing in art education and in teaching of chemistry in the arts and music sections.

Implementation:

In the case of initial training, there is a compulsory course in new technologies comprising the following options: a beginner's course in the use of the computer, a more advanced computer science course, a beginner's course in audiovisual media, and programmed instruction.

In the case of in-service training, the University runs a training course for mathematics teachers, visits to foreign countries, workshops and conferences.

Products:

The development of teaching aids.

The Netherlands

Free University of Amsterdam (2)
Eindhoven University of Technology
State University at Groningen (5)
University of Twente
State University Utrecht

FREE UNIVERSITY OF AMSTERDAM
CENTRE FOR GEOGRAPHY EDUCATION

Title of project:	LEARNING THROUGH ADVENTURE: FLEXIBLE ACTOR-ORIENTED COMPUTER SIMULATION AS A MEANS TO DIFFERENTIATED LEARNING IN GEOGRAPHY
Person to contact:	H.C. Trimp Department of Teacher Training for Geography Education Free University of Amsterdam De Boelelaan 1115 1081 HV - Amsterdam, The Netherlands
Duration:	From September 1987 to September 1991
Funding:	Free University of Amsterdam
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

This project evolved from the NIVO Project 1985-1988 (New Information Technology in Secondary Education). Responsibility is now in the hands of the new Project PRINT 1988-1992.

Aims:

In secondary schools:

- To investigate how a flexible, actor-oriented approach contributes to learning results in geography, in heterogenous groups;
- To study the interaction between student characteristics (motivation, pre-knowledge and experience, learning strategy), and type of learning environment (treatment).

Implementation:

The project sees the acquisition of geographical skills as involving the linking of knowledge from individual experience with more abstract, aggregated knowledge about regions. A specific computerised authoring and learning system has been designed and developed to allow for: structuring knowledge in a methodical way, in order to simulate a geographical situation; role-based interaction about people, places and regions; user driven decisions on route and data-interrogation; program-driven registration of user-decisions.

Co-operation with the schools involves the development, testing and rewriting of software and other learning materials, educational research and teacher-training. The combination of these three activities is considered essential to the project.

Products:

Final report September 1992.

FREE UNIVERSITY OF AMSTERDAM
DEPARTMENT OF COGNITIVE PSYCHOLOGY

Title of project:	MODEL SCHOOL PROJECT WEST-NETHERLANDS
Person to contact:	J.J. Beishuizen Department of Cognitive Psychology Free University of Amsterdam De Boelelaan 1111 1081 HV - Amsterdam, The Netherlands
Duration:	From May 1987 to January 1992
Funding:	– Institute for Educational Research in the Netherlands – Ministry of Education – PRINT Programme – The Universities of Amsterdam and Utrecht
Associated Universities:	– University of Utrecht (Research Group on Mathematics Education and Educational Computer Centre)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a secondary school (lower and upper) with 1 400 students:

- To study the effects of the large scale introduction of computers in a secondary school;
- In particular, to study the effects on the management structure of the school, the necessary support for teachers, and the changes in the process of teaching and learning.

Implementation:

The school was taken as a "model" and equipped with 49 computers. Nine subject areas are involved in the developing and testing of a series of experimental lessons. Descriptive methods are used for recording large scale effects, such as: attitudes and opinions of teachers towards using computers in education: the facilities provided (release hours, hardware and software, technical and pedagogical support).

The success of the lessons is evaluated and recorded.

Products:

This project is part of the national PRINT programme (1988-1992).

Final report April 1992.

EINDHOVEN UNIVERSITY OF TECHNOLOGY
FACULTY OF PHYSICS

Title of project: PRINT/VO: TRAINING PHYSICS TEACHERS IN INFORMATION TECHNOLOGIES

Person to contact: S. Feiner-Valkier
Faculty of Physics
Eindhoven University of Technology
N-laag, Postbus 513
5600 - MB Eindhoven, The Netherlands

Duration: From August 1989 to July 1992

Funding:
- PRINT/VO
- University of Technology of Eindhoven

Associated Universities:
- University of Amsterdam, Education in Physics (co-ordinator)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In all upper secondary schools in the Netherlands:

- To train physics teachers in the context of a new national curriculum changed in 1990.

Implementation:

The national curriculum for physics at secondary schools was changed in 1990. The most important change was the introduction of information technologies in this curriculum. The University of Eindhoven has accepted the responsibility to run nine of the 30 courses organised nationally to train physics teachers for this change. Each course consists of 15 meetings of three hours. Every school in the Netherlands is obliged to send one physics teacher on this course, which is given at various locations across the country.

The main part of the courses consists of practical exercises and theoretical background. The courses and school material (hardware and software) were developed with the help of schoolteachers.

On completion of the course, teachers receive a non-award certificate.

Products:

Teacher training in the new technologies, as part of the PRINT national project 1988-1992.

STATE UNIVERSITY AT GRONINGEN
DEPARTMENT OF TEACHER TRAINING

Title of Project: NEW INFORMATION TECHNOLOGY FOR SECONDARY EDUCATION (NIVO)

Person to contact: F.M. Muilhema
Department of Teacher Training
State University at Groningen
Westersingel 30
9718 CM - Groningen, The Netherlands

Duration: From September 1988 to May 1989

Funding: NIVO Project

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

NIVO was the nationwide project (1985-1988) in the Netherlands designed to provide secondary schools with the means of using modern technologies.

Aims:

In seven lower and upper secondary schools:

- To provide schools with the means to use information technologies in teaching history.

Implementation:

- Hardware and basic software have been provided by NIVO;
- Specific software has been produced;
- Teacher training was carried out in two stages: general introduction of information technologies and specialised courses for subject teachers.

Products:

Internal report June 1989.

STATE UNIVERSITY AT GRONINGEN
DEPARTMENT OF EDUCATIONAL SCIENCE

Title of Project: **RITS (Reflexive Intelligent Tutoring Systems)**

Person to contact: A. de Haan
Department of Educational Science
Faculty of Pedagogical Studies
State University at Groningen
Grote Rozenstraat 34
9712 TJ - Groningen, The Netherlands
Tel. 31 50 63 65 61

Duration: Ongoing from January 1990

Funding: Ministry of Education

Associated Universities: Higher Education Institute of Windesheim

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In vocational schools, in teaching spatial mathematics:

- To develop an interactive environment (The "co-operative" computers).

Implementation:

The methodology involved is called Reflexive Intelligent Tutoring Systems. It is based on a procedural approach towards human computer interaction and parallels the pragmatic approach towards human (linguistic) interaction. This method uses techniques from Artificial Intelligence to establish a co-operative partner for the user.

Monthly meetings are held.

Products:

RITS software in Mathematics is expected.

STATE UNIVERSITY AT GRONINGEN
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

Title of project: AUTOMATIC DATA AQUISITION IN MATHEMATICS EXAMINATION

Person to contact: S.L. Kemme
Faculty of Mathematics and Natural Sciences
State University at Groningen
Landleven 5, POB 800
9700 AV - Groningen, The Netherlands
Tel. 31 50 633 969

Duration: From April 1988 to September 1991

Funding: PRINT

Associated Universities: University of Amsterdam

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six secondary schools:

- To introduce new technologies in schools;
- To develop software and subject matter for a new implementation of Automatic data aquisition in the final examination of mathematics at secondary level.

Implementation:

Schools experiment with the materials developed at the Universities, and have an important influence on the final products.

Teachers and researchers meet monthly. Researchers visit classrooms to observe experiments.

Products:

Project is linked to PRINT another 5-year (1988-1992) national plan which aims at introducing new technologies in schools.

Final report September 1991.

STATE UNIVERSITY AT GRONINGEN
DEPARTMENT OF PHYSICS EDUCATION
DEPARTMENT OF TEACHER TRAINING

Title of project: RESEARCH ON MOTIVATION ASPECTS CONCERNING NEWLY DEVELOPED CURRICULUM MATERIALS FOR INFORMATION TECHNOLOGIES IN PHYSICS

Person to contact: Q. Mazereeuw
Departments of Physics Education and Teacher Training
State University at Groningen
Nijenborgh 16
9747 AG - Groningen, The Netherlands
Tel. 31 50 63 4945 – Fax: 31 50 63 4200

Duration: From January 1989 to December 1991

Funding:
- Government
- State University at Groningen

Associated Universities: Northern Education Institute Leerwarden

BRIEF DESCRIPTION OF THE PROJECT

The project is part of the PBN project between the Universities of Amsterdam, Eindhoven, Nijmegen, Utrecht and Groningen.

Aims:

In two lower and upper secondary schools:

- To introduce new information technologies in the updating of the physics curriculum;
- To investigate the effects on the motivation of students on issues of the new curriculum;
- To prepare teachers to cope with these changes.

Implementation:

One of the issues in the updating of the physics curriculum in secondary schools is the introduction of new information technologies. Pupils have to deal with the technical background, the purpose and working of different automatic and logic systems, and with the use of microcomputers as a measuring instrument in experiments in physics. New materials are being developed and their effects on motivation of students are evaluated.

Teacher training courses are organised for teachers to help them cope with the new aspects of the curriculum. Meetings are held regularly, alternating between the schools and the University. Trainee teachers carry out some well-defined roles in the research.

Products:

New curriculum materials.
Final report January 1992.

STATE UNIVERSITY AT GRONINGEN
DEPARTMENT OF CHEMISTRY EDUCATION
DEPARTMENT OF TEACHER TRAINING

Title of project:	RESEARCH ON EVALUATION CONCERNING NEWLY DEVELOPED CURRICULUM MATERIALS FOR INFORMATION TECHNOLOGIES IN CHEMISTRY
Person to contact:	P. van Zandbergen Departments of Chemistry Education and Teacher Training State University at Groningen Nijenborg 16 9747 AG - Groningen, The Netherlands Tel. 31 50 63 5364 – Fax: 31 50 63 5380
Duration:	From May 1990 to August 1991
Funding:	The Government
Associated Universities:	University of Amsterdam

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five lower and upper secondary schools:

- To introduce new information technologies in the updating of the curriculum for chemistry;
- To develop new materials for pupils and to investigate the effect on and motivation of pupils in the context of new issues its the curriculum of chemistry in secondary schools;
- To prepare teachers to cope with these changes.

Implementation:

One of the issues in the updating of the chemistry curriculum in secondary schools is the introduction of new information technologies. Pupils have to deal with the technical background, the purpose and working of different automatic and logic systems, and with the use of microcomputers as a measuring experiment in experiments in physics. New materials are being developed, and being evaluated.

Teacher training courses are organised for teachers to help them cope with the new aspects of the curriculum. Meetings are held regularly, alternating between the schools and the University. Trainee teachers carry out some well-defined roles in the research.

Products:

Final report 1991.

UNIVERSITY OF TWENTE
DEPARTMENT OF COMPUTER SCIENCE

Title of project: INSTRUCTIONAL DESIGN FOR LEARNING TO PROGRAM IN A RELATIONAL DATABASE QUERY LANGUAGE

Person to contact: E.M. Van Dijk
Department of Computer Science
University of Twente
PO Box 217
7500 AE - Enschede, The Netherlands

Duration: From August 1987 to August 1991

Funding:
- University of Twente
- Grant from the SVO Foundation

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two schools, lower and upper secondary:

- To study the problem-solving process in informatics;
- To consider the products of the problem-solving activities of students.

Implementation:

The course is concerned with the methodology of problem-solving. A comparison is made of two problem-solving strategies and the process and the resulting products are evaluated. Attention is paid to the effects of several cognitive styles (field dependence-independence, reflection-impulsivity, verbal intelligence) on the problem-solving behaviour of the students.

The first method ("top-down") consists of a global description of the problem, followed by breakdown into subproblems, each of which can be solved independently, also by dividing into further problems. Thus, the subprograms gradually get smaller. Eventually they are small enough to give the solution in a relational database Structured Query Language (SQL) immediately. In the second method, parts of the solution of the problem are worked out in detail immediately, although it is not yet clear how these parts fit into the final solution. The final solution is composed using the parts already worked out in detail.

Products:

This project was initiated by the University, but it is part of a major project initiated by the Ministry to study the wider implementation of information technology in schools.

Final report August 1991.

STATE UNIVERSITY UTRECHT
INSTITUTE OF EDUCATION

Title of project: USING COMPUTERS IN THE CLASSROOM

Person to contact: J.S. ten Brinke
Diwit Research Group
IVLOS Institute of Education
State University Utrecht
Heidelberglaan 2
PO Box 81020
3508 TC - Utrecht, The Netherlands
Tel. 31 30 53 2342 – Fax: 31 30 53 2741

Duration: From March 1989 to June 1991

Funding:
- State University of Utrecht
- IBM Nederlands, Videa Nederland
- Rijksinkoopbureau

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one upper secondary school (12-15 years):

- To increase knowledge of the possibilities of Information Technology applications at the level of the daily teaching of teachers in the Dutch secondary educational system.

Implementation:

This is a long-term research project dedicated to the respective pedagogies and methodologies of geography, history and modern languages. The didactic behaviour of individual teachers is seen as the decisive factor in the process of integration of the computer in subject teaching. Three fields of research are covered: 1) The relation between teaching style (presentation; information vs. elicitation; managing the discovery of learning process and Information Technology. 2) Classroom-management and Information Technology: the permanent availability of hardware and software in class and in the teacher's home; the total complex of didactic interventions and procedures in class and the preparation, execution and evaluation of lessons. 3) Integration of Information Technology in the daily teaching practices of the teacher: the possibilities of regular and integrated use of Information Technology by the teacher in all forms of curricula.

The project is a "Joint Study Agreement" between the State University of Utrecht and IBM Nederland.

Products:

Final report July 1991.

Massey University (3)
University of Otago
Victoria University of Wellington

MASSEY UNIVERSITY
EDUCATIONAL RESEARCH AND DEVELOPMENT CENTRE

Title of project: THE FREYBERG INTEGRATED STUDIES PROJECT

Person to contact: C. J . Patrick Nolan
Educational Research and Development Centre
Faculty of Education
Massey University
Private Bag
Palmerston North, New Zealand
Tel. 64 6 356 9099 – Fax: 64 6 350 5619

Duration: From January 1986 to December 1989

Funding:
- Massey University
- IBM New Zealand Ltd.
- Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

The Freyberg Integrated Studies Project is a secondary schools curriculum research and development project. It progressively developed and field tested new types of integrated curricula across Grades 8 to 11 as an alternative to the traditional approach. Within these curricula, out of class activities, integrated curriculum materials and computer applications all play a key role.

Aims:

- Examine the capability of integrated curriculum approaches, incorporating widespread computer use (e.g., databases, spreadsheets, wordprocessing, desktop publishing), to improve the educational effectiveness of New Zealand secondary schooling and to develop integrated curriculum models for use in the secondary education system. Specific foci of the project research included: effects of programmes on student attitude, motivation and performance, teacher development, innovation adoption and computer access and use issues.

Implementation:

Students at all grade levels were exposed to a curriculum innovation involving three components: integration of core subjects, out-of-class activities which served as the basis of in-class studies, and extensive use of computers using applications software. Comparison data were obtained from normal programme students in parallel classes.

Longitudinal research is ongoing, but interim results show: the elimination of virtually all the inequities of computer access and use reported internationally; students and teachers accepting the computer as a learning tool but decay of attitudes to a "taken for granted" level in the third year, consistently high valuation of out-of-class activities in making school learning relevant, and enhanced educational performance of project students in the Grade 10 national School Certificate examinations.

Products:

Published curriculum resources and teaching materials and a series of published articles, ongoing.

MASSEY UNIVERSITY
EDUCATIONAL RESEARCH AND DEVELOPMENT CENTRE

Title of project: MASSEY UNIVERSITY SCHOOL ADMINISTRATION BY COMPUTER PROJECT (MUSAC)

Person to contact: C. J. Patrick Nolan
Educational Research and Development Centre
Faculty of Education
Massey University
Private Bag
Palmerston North, New Zealand
Tel. 64 6 356 69099 – Fax: 64 6 50 5619

Duration: Ongoing from 1988

Funding: Self funding (from sales of software)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In seven hundred schools (all levels):

- To provide support for school administration throughout New Zealand.

Implementation:

Two software packages are the flagship of MUSAC: 1) *"Pupils Files"* (a comprehensive database for the management of all information related to pupils). This package allows up to eighteen screens of pupil information, with date entry features, covering all those items required by the Ministry of Education in all types of schools, from pre-school through to adult students and night classes. It has many user definable features, including a list design module, integrated word processing module and pre-defined lists; 2) *"School Accounts"* (a comprehensive means of handling in-house accounting enabling schools to independently and efficiently manage their own finances). The package manages up to 26 different charts of accounts, each with up to 1000 user-specified ledgers.

Other packages available are: Marks Analysis: Electronic Markbook: School Timetable: Absences: School Wages: Resource Manager.

Products:

Software packages.
Series of published articles, ongoing.

MASSEY UNIVERSITY
EDUCATIONAL RESEARCH AND DEVELOPMENT CENTRE

Title of project: SCHOOLS SHARING INFORMATION NETWORK (SSINet)

Person to contact: C. J. Patrick Nolan
Educational Research and Development Centre
Faculty of Education
Massey University
Private Bag
Palmerston North, New Zealand
Tel. 64 6 356 9099 – Fax: 64 6 350 5619

Duration: Ongoing from 1988

Funding: Self funding, with IBM New Zealand participation

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For schools all over New Zealand:

- To support the work of teachers by enabling them to share their best educational ideas and to gain national recognition;
- To enhance the educational effectiveness of schools.

Implementation:

The electronic network SSINet will use the latest computer technology to collect, process and disseminate the best teaching methods and strategies, curriculum ideas and approaches, and educational materials and resources developed by New Zealand teachers. The project will build upon recent school-based research and development projects which implemented computer applications across the curriculum, and resulted in more effective planning and collaboration in sharing information and ideas.

In collecting, generating and disseminating educational methods and models, SSINet will employ a number of media for the transfer of information ranging across satellite communications, telecommunication between remote computer terminals and a central computer.

IBM New Zealand Ltd provided the funding to set up the project.

Products:

Series of published articles, ongoing.

UNIVERSITY OF OTAGO
DEPARTMENT OF EDUCATION

Title of project: INFORMATION TECHNOLOGY IN EDUCATION AND CHILDREN (ITEC)

Person to contact: Kwok-Wing Lai
Department of Education
University of Otago
P.O. Box 56
Dunedin, New Zealand
Tel. 64 771 640

Duration: From January to October 1990

Funding: University of Otago

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a primary school:

- To investigate the conditions under which computer use in schools is associated with the development of higher level thinking and problem solving skills in children.

Implementation:

ITEC is an international Project which was initiated by the Bulgaria Committee for Science and Education and UNESCO. It concerns twenty four classrooms (9-10 years) and 25 classrooms teachers, representing seventeen countries.

With the help of the classroom teacher, the researchers observe both ordinary classroom lessons and lessons involving computer use in one particular class. Four 15-20 minute videotape segments have been made of each of the classes. Extensive information has been collected about the teachers, the schools, the educational environment in the schools and classrooms, the children themselves, the principals, the social interactions that characterise computer use in the classroom, the ways in which computers are used, and the reasons why the teachers believe the computer activities provide higher level learning experiences for their students. Data collected can provide cross-cultural comparisons.

Products:

Final report May 1991.

VICTORIA UNIVERSITY OF WELLINGTON
EDUCATION DEPARTMENT

Title of Project: COMPUTERS IN SCHOOLS

Person to contact: Barbara Craig
Education Department
Victoria University of Wellington
P.O. Box 600
Wellington, New Zealand
Tel. 64 4 721 000

Duration: Being developed

Funding: Telecom New Zealand

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary school:

- To develop resources for the training of teachers in the use of information and communications technology.

Implementation:

The Project is a co-operative endeavour between the University, the school and the telephone company, Telecom. All areas of the primary school curriculum will be covered.

Students at Victoria University taking the Education Department course entitled "Children, Computers and Schools", will have the opportunity also to participate in the project.

Eventually a training team of university teachers, school teachers and Telecom communication technology experts will visit other schools in a training capacity.

Products:

Teacher training programs.

Norway

Hamar College of Education (3)
Stord College of Education (2)
Telemark College of Education (3)
University of Trondheim

HAMAR COLLEGE OF EDUCATION
INFORMATICS SECTION

Title of project: COMPUTERS FOR STUDENTS WITH SPECIAL NEEDS

Person to contact: Anne Berit Fuglestad
Informatics Section
Hamar College of Education
Holsethgt. 31
2300 - Hamar, Norway
Tel. 47 65 22040

Duration: From August 1988 to June 1989

Funding: Hamar College of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one school, in primary and lower secondary education:

- To link further teacher training in special education to special needs teaching in mathematics;
- To develop a computer program for mathematics, based on diagnostic tests of students.

Implementation:

Teachers involved in the project were training to teach children with special needs, and some had training in informatics. The program used pictures of hardcopy teaching materials and symbols and methods closely linked to traditional teaching methods.

Meetings were held approximately 2-4 times a week.

Products:

Final report June 1989.

HAMAR COLLEGE OF EDUCATION
INFORMATICS SECTION

Title of project: COMPUTER ASSISTED LEARNING

Person to contact: Anne Berit Fuglestad
Informatics Section
Hamar College of Education
Holsethgt. 31
2300 - Hamar, Norway
Tel. 47 65 22040

Duration: From August 1986 to December 1990

Funding: Ministry of Education and Research

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two schools, in primary and lower secondary education (1-6 grade, i.e. 6-12 years old):

- To develop the use of computers as a natural part of teaching and learning;
- To develop the children's feeling of control of the computer and to stimulate social training and discussions;
- To test the limitations of a programming tool *"The Director"* (developed by the Norwegian Ministry of Education) which combines interactive stories with separate program modules into one complete program.

Implementation:

Teachers had a one year course in informatics.

Different programs were used, particularly in Norwegian language and mathematics. In teaching language, word processing was used both for free writing and for exercises where pupils had to fill in the right word and correct mistakes. In mathematics, LOGO programming and problem solving in the LOGO environment were used, mainly with turtle-geometry. An adventure game was also designed to enable students to solve problems with fractions. In this software, "The Director" was used for programming and "De Lux - Paint" and a hand scanner were used for pictures.

Products:

Reports on word processing and LOGO activities June 1988.

The report on Adventure-Fractions, together with the test of the limitations of *"The Director"* concerning the designing of mathematics programs in 1991.

HAMAR COLLEGE OF EDUCATION
INFORMATICS SECTION

Title of project: COMPUTER AS A TEACHING TOOL: NORWEGIAN AS SECOND LANGUAGE

Person to contact: Anne Berit Fuglestad
Hamar College of Education
Holsethgt. 31
2300 - Hamar, Norway
Tel. 47 65 22040

Duration: From September 1989 to May 1992

Funding:
- Hamar College of Education; Director of Schools; Schools Office, Hamar;
- Council for Refugees; Red Cross Nursery.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two schools in pre-primary and primary education, working with non-Norwegian mother-tongue pupils:

To use computers for teaching Norwegian language and mathematics with concept keyboard in developing concepts:

- Beginning mathematics: relations, quantities, series, shapes;
- Introductory language teaching;
- Support for reading based on spoken language.

Implementation:

In the primary school, the work was done with children of age 5 to 8. The students were Vietnamese, Chinese, Iranian and Norwegian students with special needs.

The students use concept keyboard for communicating with the computer programs. Special overlays are made for the project with pictures, or text written in Norwegian, Iranian or Vietnamese.

The computer was not used in isolation, but integrated into the teaching and traditional materials.

Teachers had been trained in special education.

The working group met every two weeks, making materials and preparing software. The project planning group meets once a month.

Products

Final report September 1992.

STORD COLLEGE OF EDUCATION
MUSIC DEPARTMENT

Title of project: MICROCOMPUTERS AS AN AID IN CREATIVE MUSIC-MAKING FOR CHILDREN

Person to contact: Vidar Andersan
Music Department
Stord College of Education
5414 - Rommetveit, Norway

Duration: From 1986 to 1991

Funding: Stord College of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a primary and lower secondary school:

- To investigate how children between 10-13 years of age can use computers for creative music-making;
- To prepare the way for such projects on a larger scale, with co-operation between higher education and schools for future development.

Implementation:

The project was initiated as a part of a larger project aiming at the development and construction of designs for music computer application. The project is seen as a preparatory one; therefore the scope and aims were rather limited.

Four studies were undertaken:

- Composing melodies from a text basis;
- Composing melodies from a triad scheme;
- Arranging the melodies;
- Experimenting with sounds; creating sound pictures.

Classroom trials were carried out, with tape-recordings being made of childrens' products.

The teacher involved made this experiment part of her inservice training. The project leader and project teacher were both teacher trainees. Regular planning meetings took place.

Products:

Final report 1991

STORD COLLEGE OF EDUCATION
PHYSICS DEPARTMENT

Title of project: THE COMPUTER AS A SENSING AND CONTROLLING INSTRUMENT – A TRIAL WITH 11-12 YEAR OLDS

Person to contact: Leif Wedoe
Physics Department
Stord College of Education
5414 - Rommetveit, Norway

Duration: From October 1988 to June 1989

Funding: National Advisory Council for Schools

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In a primary and lower secondary school:

- To investigate how pupils (12-13 years) can acquire fundamental skills and develop a basic understanding of the laws of electricity and electronics and how the computer functions as a sensing/controlling instrument;
- To develop teaching strategies to counteract eventual significant differences in the achievements of the two sexes;
- To develop a scheme of work for teaching electricity, electronics and computer skills within the framework of the general curriculum.

Implementation:

The actual design and execution of the project was performed by the Stord College of Education. The project was a rather limited one, with two persons directly involved over 6 weeks with a total of 32 classroom periods.

Meetings were arranged informally, usually in conjunction with project work.

Teacher trainees were informed of the progress and main results of the project.

Products:

Final report Spring 1989.

TELEMARK COLLEGE OF EDUCATION
ART AND CRAFTS SECTION

Title of project: MICROCOMPUTERS IN ART EDUCATION

Person to contact: Steinar Kjosavik
Art and Crafts Section
Telemark College of Education
3670 - Notodden, Norway
Tel. 47 36 10200

Duration: From January 1990 to Spring 1991

Funding:
- National Council for Primary and Secondary Education
- Baerum Municipal Pedagogical Center

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary and one lower secondary school, in computer graphics:

To investigate the following questions:

- How microcomputers influence creative work;
- How it is possible to challenge the creative abilities more than the intellectual, cognitive, technical abilities;
- How microcomputers may improve the understanding of aesthetics, with special emphasis on the use of colours;
- How microcomputers may be used as a skech-book in an interactive creative and analysing process (important, as, when using computers, the process can be saved step-by-step and is reversible).

Implementation:

The project uses the Commodore Amiga computer and the program "DeLuxe Paint". The teacher trainee was responsible for a great part of the daily co-ordination. Technical training was provided for the teachers.

A second stage of the project is under development, based on the first stage report and evaluation.

Products:

An increase in teachers qualified in the use of new information technologies.

An advance in achieving the aim of the Norwegian Ministry of Education that the new technologies be part of all subjects in primary and secondary education.

A report at the end of the first phase of the project. A second report in August 1991.

TELEMARK COLLEGE OF EDUCATION
CENTRE FOR PEDAGOGICAL RESEARCH AND DEVELOPMENT

Title of project:
Project 1: Process Writing on Microcomputers in Primary and Lower Secondary School
Project 2: "Autograf" as an Instrument for Teaching Norwegian in Primary School

Person to contact: Dag Aanderaa
Centre for Pedagogical Research and Development
Telemark College of Education
3670 - Notodden, Norway
Tel. 47 36 10200 – Fax: 47 36 52253

Duration:
– *Project 1:* From January 1988 to November 1990
– *Project 2:* From November 1990 to November 1992

Funding: National Council for Primary and Lower Secondary Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

Project 1: In two classes of a primary/lower secondary school:

– To develop methods for improving writing in Norwegian mother-tongue, especially process writing, on computers.

Project 2: In two primary schools:

– To develop methods for teaching process writing in Norwegian mother-tongue to small children (2-3 grade), using "Autograf", an advanced Word Processor with a rather simple user interface especially developed for teaching.

Implementation:

Project 1. Classes used Word Processor BRUM in their compositions, as an aid to pre-writing work and the first draft. Students were encouraged to read each others' compositions and respond. Thus, peer co-operation was increased. The method was also used to encourage students to write more and to do more revision.

Project 2. The project will investigate how "Autograf" is related to: the subject goals, knowledge, attitudes and skills; dissimilar goal-groups; the need to find solutions and take initiatives; the need for extra resources (teachers/grants); the need for special competence for teachers.

Teachers and researchers meet four times a year. The researcher attended many lessons in the schools, often giving advice to teachers.

Products:

First report in November 1990. Final report December 1992.

TELEMARK COLLEGE OF EDUCATION
CENTER FOR PEDAGOGICAL RESEARCH AND DEVELOPMENT

Title of project: DISTANCE EDUCATION IN MATHEMATICS BASED ON ELECTRONIC MAIL AND COMPUTER CONFERENCING

Person to contact: Gard Brekke
Center for Pedagogical Research and Development
Telemark College of Education
3670 - Notodden, Norway
Tel. 47 36 10200 – Fax: 47 36 52253

Duration: From January 1991 to September 1992

Funding:
- Ministry of Education and Research
- Section for Continued Training of Teachers

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In in-service teacher training in primary and lower secondary education (the schools which will take part in the project have not yet been selected):

- To develop, establish and evaluate an in-service course in mathematics for teachers;

  Through the use of distance learning, to gain optimal benefit from grants for in-service training for teachers (due to a scattered population and long distances, this is expensive in Norway).

- To help augment the number of qualified mathematics teachers in primary and secondary schools in Norway. (About 50 per cent of the teachers actually teaching mathematics in lower secondary schools in Norway lack formal education in the subject);
- To contribute to teachers' awareness of the educational potential of computer communication.

Implementation:

One of the important aspects of distance education based on electronic mail and computer conferencing is the possibility to create a social environment for learning (a so-called "virtual classroom"). Close co-operation with school teachers is necessary to develop and evaluate this component of the in-service course.

The course will be equivalent to a half-year's fulltime study. A special group is established for each project, to ensure close co-operation between researchers, teachers and schools.

Products:

Computer conferences to be used for counselling and exchange of teaching ideas among mathematics teachers in schools (e.g. among teachers having completed the in-service training course).

Final report December 1992.

UNIVERSITY OF TRONDHEIM
DEPARTMENT OF COMPUTING SCIENCE

Title of project: DISTANCE LEARNING WITH WINIX

Person to contact: Bodil Ask
Department of Computing Science
University of Trondheim
7055 - Dragvoll, Norway
Tel: 47 59 1844

Duration: From September 1990 to 1992

Funding:
- Ministry of Research and Education
- University of Trondheim (equipment)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five upper secondary schools:

- To enable teachers who will be using computer software for distance learning to gain experience with the Winix concept (communication system);
- To develop and use software for distance learning;
- To evaluate the learning effects of the system.

Implementation:

The five schools are already connected to the network SIRNETT (Schools in a Regional Network).

Teachers will be offered a course in computer science, arranged as distance learning/in-service training. They will be given the opportunity of gaining a university degree to be studied at distance.

On the University side, researchers will be able to: gain experience in using the Winix system; implement software and have experience of interactive communication with distant students.

An evaluation of the achievements of distant students compared with ordinary students at the University will follow.

Regular meetings will take place using the Winix net "channel".

Products:

Final report 1992/1993.

Portugal

University of Aveiro
Polytechnic Institute of Beja
University of Coïmbra
Higher School of Education of Lisbon
University of Lisbon
University of Minho (5)
University of Oporto

THE MINERVA PROJECT

The MINERVA Project started on an experimental basis in 1985/86. Since 1989/90 it has become the National Project for the introduction, promotion and development of New Information Technology (NIT) in Portuguese Primary and Secondary Education.

Its aims are:

- To provide schools with IT equipment;
- To educate teachers and teacher trainers;
- To develop educational software;
- To promote educational IT research in Primary and Secondary schools;
- To highlight educational IT research as a means of changing teachers' roles in the teaching/learning process and making schools a wide-open universe;
- To develop IT use towards active life.

MINERVA is supported by the Portuguese Ministry of Education under the responsibility of a National Co-ordination Committee run at the Planning and Research Bureau (GEP).

The Project operates at several nodes run by Universities and Higher Schools of Education networking the schools of different levels all around the country in co-operation with the Regional Education Bureaux aiming to create a gradual and controlled expansion network.

These nodes are autonomous as to the definition of programmes, development and research.

Each node team trainers involve university teachers and teachers of primary and secondary education.

The following Projects are examples of activities undertaken by some nodes.

UNIVERSITY OF AVEIRO
TEACHER TRAINING CENTRE

Title of project: PROJECT MINERVA – UNIVERSITY OF AVEIRO NODE

Person to contact: A. J. Ferrer Correia
Teacher Training Centre
Projecto MINERA, CIFPUA
Universidade de Aveiro
3800 - Aveiro, Portugal
Tel. 351 34 25085 – Fax: 351 34 28600

Duration: Ongoing from 1985

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In the 52 schools in the District of Aveiro involved in the Project (18 primary schools, 14 secondary schools, 20 upper education schools, 2 schools for special education and 1 private school):

- To train teachers in the use of new information technologies;
- To provide support for the schools involved in the Project;
- To procure software, courseware and other materials;
- To promote the installing of the appropriate facilities and equipment;
- To develop and evaluate courseware;
- To set up research teams for specific areas.

Implementation:

For the secondary schools and schools of higher education the subject matters concerned are languages, mathematics, biology, history, technical education and physics.

Products:

Report due in 1992.

POLYTECHNIC INSTITUTE OF BEJA
DEPARTMENT OF NEW INFORMATION TECHNOLOGIES

Title of Project: PROJECT MINERVA – NODE OF THE HIGHER SCHOOL OF EDUCATION OF BEJA

Person to contact: Rui Joao Baptista Soares
Department of New Information Technologies
Higher School of Education
Instituto Politecnico de Beja
Rua de Santo Antonio, 1-A
Pavilhoes do I.P.B.
7800 - Beja, Portugal
Tel. 351 84 284 25 - Ext. 311 – Fax: 351 84 215 771

Duration: Ongoing from 1989

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In twenty-one schools, primary, lower and upper secondary:

– To investigate the use of the computer as a working tool in education for both teachers and students.

Implementation:

The project explores a basic range of applications which include word processing, drawing, graphics, database, spreadsheets and programming languages (LOGO, BASIC). The implications of the use of software are taken into acount in areas such as concept development and interdisciplinary projects.

An inquiry was carried out to investigate teachers' attitudes towards the use of computers.

Products:

Final report July 1993.

UNIVERSITY OF COIMBRA
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

Title of project: PROJET MINERVA – UNIVERSITY OF COIMBRA NODE

Person to contact: Teresa Mendes
Computer Science and Systems Unit
Department of Electrical and Computer Engineering
Universidade de Coimbra
3000 - Coimbra, Portugal
Tel. 351 39 724 275 – Fax: 351 39 724 266

Duration: Ongoing from October 1985

Funding:
- Ministry of Education
- National Institute of Scientific Research
- Some European Programmes

Associated Universities: Universities of Aveiro, Lisboa, Minho, and Porto.

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 68 schools, at all levels of education, in the District of Coimbra:

- To introduce information technologies in educational practice and in the school curricula;
- To train teachers and teacher trainers for this change.

Implementation:

Activities in schools comprise teacher training and the organisation and dynamisation of computer use by pupils. These activities are perfomed by teacher trainers who are allocated to the project on a full-time basis for periods of three to four years. Initially, these trainers follow a six months training programme at the University. They begin their activities in schools, but still work with the University group, either by collaborating in various research projects, some of them international, or by receiving complementary training on specific topics.

Another main interest of the University group, as a part of the MINERVA project, is the development of educational software to be used in schools. Teachers working with the group on a full-time basis contribute significantly to the specification and pedagogical design of new packages.

Products:

Final report October 1992

UNIVERSITY OF LISBON
FACULTY OF SCIENCES
DEPARTMENT OF EDUCATION

Title of Project: PROJECT MINERVA – NODE OF THE UNIVERSITY OF LISBON

Person to contact: Joao Pedro Mendes da Ponte
Department of Education, Faculty of Sciences
University of Lisbon
Av. 24 de Julho 134-4
1300 - Lisbon, Portugal
Tel. 351 1 602 502 – Fax: 351 1 604 546

Duration: Ongoing from October 1985

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In thirty-eight schools, in and outside Lisbon, six primary (grades 1-4), eleven middle (grades 5-6 or 5-9) and twenty-one secondary schools:

– To explore the use of the computer as a working tool to be used by students in their projects and learning activities.

Implementation:

The main lines of work concern the use of computers: as support for cross-subject projects, regarding the development of skills to deal with large amounts of information and critical thinking; in specific subjects, specially mathematics, science, history, geography and social sciences, and languages; in training teachers to use computers in education, and training of school co-ordinators and supervisors; in development of innovative projects, such as the establishment of telematic links between schools; in production of support materials.

Research undertaken concerns: the implications of word processing in native and foreign language learning; working environments in primary school using LOGO; use of LOGO programming activities and microworlds, and student' attitudes, and concepts in mathematics; use of spreadsheets in problem solving ability and in concept development in mathematics; use of computers with very low achieving students; a resource for interdisciplinary projects and activities; teachers' attitudes to computers.

Products:

Final report July 1993.

HIGHER SCHOOL OF EDUCATION OF LISBON

Title of Project: PROJECT MINERVA – NODE OF THE HIGHER SCHOOL OF EDUCATION OF LISBON

Person to contact: Maria Cecilia Soares de Morais Monteiro
Escola Superior de Educaçao de Lisboa
Rua Carolina Michaelis de Vasconcelos
1500 - Lisbon, Portugal
Tel. 71 41 929 – Fax: 71 41 878

Duration: Ongoing from 1986

Funding: Ministry of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In forty-seven schools in Lisbon (pre-primary, primary and lower secondary):

- To develop the use of computers in interdisciplinary projects, both curricular and extracurricular;
- To study the introduction of computers in specific curriculum areas, developing materials and investigating innovative ways of learning in mathematics, biology, foreign languages, Portuguese, history and social studies, and music;
- To implement a teacher training programme for the above, with particular emphasis on teacher attitudes towards learning.

Implementation:

The teacher training component involves technical/pedagogical seminars, as follows: short initial technical training; training in more detail for projects which teachers will develop in their schools with students; the links between pedagogical and technical training; annual joint presentation of the work of the schools; direct support in the school by teacher trainers.

The courses are followed by evaluation and sharing of experiences between participants.

Products:

Final report 1993.

UNIVERSITY OF MINHO
SCHOOL OF ENGINEERING

Title of project: PROJECT MINERVA – UNIVERSITY OF MINHO NODE
New Information Technologies in the Teaching and Learning of Languages

Person to contact: Altamiro Barbosa Machado
Project Minerva
Universidade do Minho
Largo do Paço
4719 - Braga Codex, Portugal
Tel. 351 53 614248 – Fax: 351 53 77936

Duration: From March 1987 to July 1992

Funding:
- Ministry of Education
- Schools involved in the Project
- Local authorities

Associated Universities:
- Université de Paris-Nord, France
- Université de Toulouse, France
- University of Oporto, Portugal
- College of St. Mark and St. John, United Kingdom

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In ten schools (4 pre-primary, 2 lower secondary and 4 upper secondary):

- To employ new information technologies in the learning of languages, using a strategy similar to that of action-research, in order to study their impact on the students' intellectual and social development, and on the interactions observed between classes and within these classes.

Implementation:

The project as a whole covers a number of different activities, the objectives of which are:

- To establish and strengthen links, both nationally and internationally, with other universities and institutions;
- To develop, evaluate and disseminate the documentation available in the field covered by the project;
- To promote contacts at local, national and international level to discuss issues relating to this area of work.

Activities in 1990-1991 involve: New technologies, Mother tongue and cognitive development; MOSAIC: A holistic approach to the child's first contacts with its mother tongue; Teaching and learning of French as a foreign language; INFOR-HELP: to learn English and facilitate use of the computer.

Products:

Final report scheduled for October 1992.

UNIVERSITY OF MINHO
SCHOOL OF ENGINEERING

Title of project: PROJECT MINERVA - UNIVERSITY OF MINHO NODE
Development of Local Training and Resource Centres (CAL)

Person to contact: Altamiro Barbosa Machado
Project Minerva
Universidade do Minho
Largo do Paço
4719 - Braga Codex, Portugal
Tel. 351 53 614248 – Fax: 351 53 77936

Duration: From 1988 to 1992

Funding:
- Ministry of Education
- Directorate-General for Primary and Secondary Education, Lisbon
- Educational Development Programme (PRODEP)
- Local trade and industry associations
- Local authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 108 schools (1 pre-primary, 52 primary, 29 lower secondary, 24 upper secondary and 2 schools for handicapped children):

–To set up Resource Centres to support the process of introducing new information and communication technologies as a teaching aid in elementary and secondary education.

Implementation:

The Resource Centres located in each school are co-ordinated by the Regional Training and Resource Centres, the objectives of which are:

- To establish local and regional infrastructures and a local communications network (by computer);
- To train supervisory teams at both regional and school level;
- To develop educational action-research projects involving university teachers and researchers and non-university teachers and specialists from every level and every field.

Products:

The University of Minho co-ordinates the Regional Training and Resou.. Centres.

UNIVERSITY OF MINHO
SCHOOL OF ENGINEERING

Title of project: PROJECT MINERVA – UNIVERSITY OF MINHO NODE
New Technologies in the Fields of Musical Composition and Interpretation

Person to contact: Altamiro Barbosa Machado
Project Minerva
Universidade do Minho
Largo do Paço
4719 - Braga Codex, Portugal

Tel. 351 53 614248 – Fax: 351 53 77936

Duration: From 1990 to 1992

Funding:
- Ministry of Education
- Educational Development Programme, Lisbon
- Gulbenkian Foundation

Associated Universities:
- University of Coimbra
- University of Reading, United Kingdom
- Higher School of Education, Lisbon

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six lower secondary schools:

- To assist in the process of reforming music teaching in the future;
- To study the importance of the use of new technologies in the development of aural perception and in children's attitude to musical improvisation, composition and interpretation;
- To analyse the influence of new technologies on students and teachers;
- To develop teaching materials that can be published and to support projects for the use of new technologies in music teaching.

Implementation:

The Resource Centres of Lisbon, Braga and Coimbra have been given the task of providing technical and pedagogical training for the teachers taking part in the project. Each school designates at least two teachers.

Products:

Report due in 1992.

UNIVERSITY OF MINHO
SCHOOL OF ENGINEERING

Title of project: PROJECT MINERVA – UNIVERSITY OF MINHO NODE
Support for the Development of Educational Projects

Person to contact: Altamiro Barbosa Machado
Project Minerva
Universidade do Minho
Largo do Paço
4719 - Braga Codex, Portugal
Tel. 351 53 614248 – Fax: 351 53 77936

Duration: Ongoing

Funding:
- Ministry of Education
- PRODEP: Educational Development Programme, Lisbon
- Local trade and industry associations
- Local authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 54 schools (20 pre-primary, 11 primary, 4 lower secondary, 14 upper secondary, 3 technical and 2 schools providing special education):

– To provide support for the development of educational projects using information technologies.

Implementation:

A system was set up to assist teachers from schools submitting projects, the aim being:

- To define, organise and evaluate each activity;
- To facilitate contacts with other schools and other projects;
- To ensure effective administration and management of the project.

Apart from advising on the choice and installation of equipment, a programme has been set up to provide training and educational assistance in the use of computers during the implementation phase.

This co-operative project between the University and a number of schools is directly associated with Portugal's Educational Development Programme (PRODEP).

Products:

Report due in 1992.

UNIVERSITY OF MINHO
SCHOOL OF ENGINEERING

Title of project: PROJECT MINERVA – UNIVERSITY OF MINHO NODE
Development of the Penada-Gérès National Park

Person to contact: Altamiro Barbosa Machado
Project Minerva
Universidade do Minho
Largo do Paço
4719 - Braga Codex, Portugal
Tel. 351 53 614248 – Fax: 351 53 77936

Duration: Ongoing from 1987

Funding:
- University of Minho
- Penada-Gérès National Park
- Educational Development Programme, Lisbon

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 21 primary schools in the Penada-Gérès National Park:

- To promote the integrated development of the Park by addressing the educational aspect through the setting-up of a data network linking all the schools.

Implementation:

The Penada-Gérès National Park was created in 1971 in north Portugal, covering an expanse of 70 000 hectares. Its population numbers 12 000 spread over 114 villages. One of the Park's major problems is the high level of under-achievement among the 1 050 pupils attending its 51 schools.

Each of the 21 schools involved in the Project has video equipment, a computer and a printer per classroom and a modem enabling them to communicate with one another through a data network.

The University of Minho is responsible for the overall co-ordination of the Project. Its progress is being followed with great interest at national and international level with the University of Norwich in the United Kingdom and the University of Valencia in Spain.

The University and the teachers assigned to the Project hold regular meetings (two a month).

Products:

A report at the end of each academic year;
Final report 1993.

UNIVERSITY OF OPORTO
MINERVA NODE DEPARTMENT

Title of project: MINERVA PROJECT – UNIVERSITY OF OPORTO NODE

Person to contact: Duarte Costa Pereira
Universidade do Porto
Rua de Ceuta, n°118 - 6° Sala 44
4000 - Porto, Portugal
Tel. 351 2 325 713 – Fax: 351 2 200 8215

Duration: Ongoing from 1985

Funding: Ministry of Education

Associated Universities: University of Aveiro

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For the 18 secondary and technical schools in the Porto District involved in the Project:

- To provide instruction for trainee teachers in computer hardware and software – of the word processing, spreadsheet and database variety – and in particular in the educational uses of the computer;
- To provide in-service training for teachers from 10 Schools Computer Centres (CEI).

Implementation:

The subject matters concerned are Portuguese and foreign languages, science and technology. Once they have finished their basic training, the newly qualified teachers can continue their work in their school's computer centre.

The responsibilities of the teachers undergoing in-service training will be to stimulate awareness and enthusiasm within their schools, encourage the submission of educational projects, help other teachers to use the different types of software, evaluate the work that is being undertaken, and aid and encourage the CEI teachers in implementing activities in the schools.

The Project is also promoting research by the University's Department of Psychology; in addition, it has a team dealing with special education.

In order to make it easier for the Oporto Node to perform its functions, *a special department has been set up within the University.*

Products:

Final report scheduled for 1992.

Spain

University of Madrid
University of Santiago de Compostela
University of Valladolid

UNIVERSITY OF MADRID
SCHOOL OF EDUCATION

Title of project: APPLICATION OF NEW TECHNOLOGIES IN TEACHING SCIENCE (ANTEC)

Person to contact: J. Cervello Collazos
Department of Teaching Science
School of Education
University of Madrid
EUFP "Maria Diaz Jiménez", Av. Filipinas, 3
28003 - Madrid, Spain

Tel. 1 39 46 736 – Fax: 1 39 46 762

Duration: From October 1989 to September 1992

Funding:
- Regional Education Authorities
- New Information and Communication Technologies Programme (PNTIC)

Associated Universities: University of Valladolid, School of Education

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one pre-primary and primary, one lower and upper secondary and one vocational school:

- To undertake research on the way computers and video are used in the classroom in order to improve the way teachers use these technologies;
- To design and to experiment with a model of teacher training to be introduced in the Teacher Training College, in specific topics from physical and earth sciences.

Implementation:

All schools in the project had been previously equipped by the PNTIC with a microcomputer classroom, or a video classroom, or both. The professors from the University act basically as facilitators, their main activity being concerned with promoting the learning capacities of teachers. A teacher, devoted full time to the project, acts as a continuous link between professors and teachers, supporting the teachers "in situ". The project, using an action research methodolgy, tries to develop in the teachers a sense of self-commitment which allows them to reflect on their work in the classroom and promote their pupils' learning capacities.

This project is closely linked to the PNTIC which covers the twenty eight Spanish provinces under the authority of the Ministry of Education and Science.

Products:

During academic year 1989-90, the teachers co-authored a paper presented at a National Meeting of Science Learning.

Two experimental courses in chemistry and earth sciences using computers and video started in 1991 for teacher trainees.

UNIVERSITY OF SANTIAGO DE COMPOSTELA
INSTITUTE OF EDUCATIONAL SCIENCES

Title of project: PROJECT TELEGAL (PHASE 1)
PROJECT ABRENTE (PHASE 2)

Person to contact: José A. Cajaraville Pegito
Department of Experimental Science and Education
Institute of Educational Sciences
University of Santiago de Compostela
Avda Juan XXIII, s/n
15704 - Santiago de Compostela, Spain

Tel. 981 583458

Duration: *Phase 1:* 1981-1985 – *Phase 2:* Ongoing from 1985

Funding: *Phase 1.* Barrié and FUNDESCO Foundations
Phase 2. Council for Education – Government of Galicia and the University of Santiago

Associated Universities: None.

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 20 pre-primary, primary and lower secondary schools, each equipped with ten compatible Pc-XTs:

– To provide teachers with in-service training in the educational uses of the computer.

Implementation:

In **Phase 1,** the training consisted mainly of an introduction to computers, programming in BASIC, the designing of drill and practice programs in BASIC and an introduction to LOGO.

In **Phase 2,** the teachers were given instruction in word processing, spreadsheets, databases, more advanced LOGO and the use of courseware currently available on the market.

Products:

In all, 180 teachers, in charge of 3 500 pupils, are involved in the Project. The success of *Phase 1,* which was an experimental phase funded by private foundations, has prompted the Autonomous Government of Galicia to assume institutional and financial responsibility for *Phase 2* through its Council for Education and University Organisation.

UNIVERSITY OF VALLADOLID
SCHOOL OF EDUCATION

Title of project:	APPLICATION OF NEW TECHNOLOGIES IN TEACHING SCIENCE (ANTEC)
Person to contact:	Maria J. Saez Brezmes Cell Biology Department School of Education University of Valladolid C/Geologo Hernandez Pacheo S/N CD 47014 - Valladolid, Spain
Duration:	From October 1989 to September 1992
Funding:	New Information and Communication Technologies Programme (PNTIC)
Associated Universities:	University of Madrid, School of Education

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one lower secondary, three upper secondary and two vocational schools in Valladolid:

- To establish a collaborative project with the University departments, to develop a relevant action-research model to analyse the impact of the introduction of new information technologies on the science curriculum and on teaching/learning processes in the classrooms.
- To design and implement an initial training model in the area of science in the School of Education using NIT educational potential and a science, technology and society integrated approach.

Implementation:

In this action-research model, teachers investigate the teaching/learning process in their classrooms. University researchers provide support to teachers and study specific questions about learning science with information technologies and more generally examine the problems raised by the introduction of information technologies in the classrooms.

This project is closely linked to the PNTIC which covers the twenty eight Spanish provinces under the authority of the Ministry of Education and Science.

Products:

Final report October 1992.

Sweden

University of Falun/Borlange (2)
University of Karlstad
University of Lulea
University of Umea
University of Uppsala (5)

UNIVERSITY OF FALUN/BORLANGE

Title of project: "FRAMTIDSBARN" CHILDREN IN THE FUTURE

Person to contact: Tommy Isaksson
University of Falun/Borlange
Box 2004
79102 - Falun, Sweden
Tel. 46 23 81921 – Fax: 46 23 81971

Duration: From 1990 to 1993

Funding:
- National Board of Health and Welfare
- University of Falun/Borlange
- Nine municipalities in Sweden

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In Childrens' Leisure Centres (7-12 years) in Sweden, some of which co-operate with primary schools:

- To introduce children to the use of new information technologies.

Implementation:

The project places special focus on girls and on children from deprived homes and their social competence.

Children' Leisure Centres have been equipped with computers and modem. Through an electronic network, twelve childrens' groups all over Sweden transmit letters and documents and produce a newspaper together, build databases, and so on.

Participants also used telecommunication to work with childrens' groups in Denmark and the United Kingdom.

Products:

Book about children in the computer society; videofilms; articles.
Final report 1993.

UNIVERSITY OF FALUN/BORLANGE

Title of project: PROJECT TO LINK UNIVERSITIES AND TEACHING ORGANISATIONS (PLUTO)

Person to contact: Tommy Isaksson
Lecturer
University College of Falun-Borlange
Box 2004
791 02 - Falun, Sweden
Tel. 46 23 81921 – Fax: 46 23 81971

Duration: From September 1987 to 1994

Funding:
- University of Falun/Borlange
- COMETT II (Commission of the European Community Project)

BRIEF DESCRIPTION OF THE PROJECT

PLUTO is a European education, industry and government project, the aim of which is to raise the level of information technology literacy and language skills in teacher training, schools and industry through practical networking. Manchester Polytechnic is the organiser of the Project, which links the the University of Vienna, Austria; the Free University of Brussels, Belgium; the University of Oldenburg, Germany; the University of Patras, Greece, and the University of Falun-Borlange, Sweden.

Aims:

In two childrens' leisure centres (7-12 years):

- To enhance new information technology training in Europe via co-operation based on the use of the electronic network EARN (European Academic and Research Network).

Implementation:

The skills covered range from those in which some expertise exists already but where there is need for enhancement (e.g. databases and spreadsheets up to the level of structured Query language) to areas in which the experience base is virtually nil (use of hypermedia). The project will involve the preparation of support for training in all of these areas, while additionally developing the use of networking as a modality for collaboration.

Products:

Published training strategies; support materials, including manuals and videos (minimum of five); identification and dissemination of specifications for further development, based on analysis of user and group needs; electronic publication of a Newsletter to disseminate information about project development; paper publication of a series of reports on project achievements.

Final report 1994.

UNIVERSITY OF KARLSTAD

Title of project: NORDEN' 90

Person to contact: Alvar Löfskog
University of Karlstad
Box 9501
65009 - Karlstad, Sweden
Tel. 46 54 83 00 20

Duration: From 1988 to August 1991

Funding:
- Nordic Council of Ministers
- Departments of Education in each of the five Nordic countries

Associated Universities:
- University of Jyvaskyla, Finland
- Stord College of Education, Norway

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In lower secondary education:

- To present a subjective view of the daily life in the Nordic countries through the use of interactive media in social science.

Implementation:

The members of the production group of the project have competence in communication (image, film, sound), pedagogy, social science and informatics. There is a production group in each of the five countries, conducted by a national project manager. The Educational Software Group of the Nordic Council of Ministers is closely associated to the Project as well as the Departments of Education of the countries.

The schools will take part mainly in the prototype test and evaluation phase and have therefore not yet become part of the project.

Products:

Final report August 1991.

UNIVERSITY OF LULEA
SCHOOL OF EDUCATION

Title of project: THE COMPUTER AS AN EVERYDAY TOOL FOR TEACHING AND LEARNING

Person to contact: Anders Söderlund
Research Department
School of Education
University of Lulea
951 87 - Lulea, Sweden

Duration: From January 1990 to December 1992

Funding: Northern Region Research Council

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary, one lower and one upper secondary school:

- To develop the use of computers as an every day tool for teaching and learning.

Implementation:

The project examines how the new storage technology, methods of communication with and between computers, as well as enhanced graphics and new tools for the development of software, can be developed and used in the complex process of teaching.

Experienced teachers work to facilitate the opening up of new possibilities for teaching and learning, where CD-ROM, CD-Video and sound are integrated into multi media products. User-friendly products in this area are being developed, with appropriate methodology for the use of computers in the school. The computer will be placed so that it is more easily available to pupils and teachers in order to become an "every-day tool".

In the long run, the project hopes to establish a way to turn the computer, as part of a multi media environment, into a tool that will help to transform classroom culture in order to encourage active intellectual pursuit over rote memorisation, and collaboration over competition.

Products:

Final report 1993.

UNIVERSITY OF UMEA
DEPARTMENT OF TEACHER TRAINING

Title of project: **SkolSNIC (SNIC: Center for Information Technology in Northern Sweden)**

Person to contact: Jan-Olof Lindström
SkolSNIC, Department of Teacher Training
University of Umea
901 87 - Umea, Sweden
Tel. 46 90 165000 – Fax: 46 90 166671

Duration: From November 1988 to June 1991

Funding:
- The Department of Education, Stockholm
- Umea University
- DEMOTEL, Telephone Company of Sweden
- Six hardware suppliers and software vendors.

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two primary, three lower and three upper secondary and two vocational schools:

- To identify and organise locally available competent and experienced teacher consultants in the use of the computer as a teaching aid; to support the in-service and pre-service training of teachers in this area;
- To initiate and implement school projects; to evaluate the potential use of computers and to provide information and advice about research and development in this field;
- To provide resources for development of educational software.

Implementation:

An informal group was constituted as a board with responsibility for running the project. Two teachers in each specific subject area were invited to join the project to train as consultants. A resource center including a computer laboratory and smaller rooms for project work was set up at the University, to keep both material and competency continuously updated. SNIC, a joint non-profit organisation for supporting the use of information technology in the region, represents the University, the County Administration Board and the County Councils and Municipal Councils of the region.

During the last year, the project offered around forty days of seminars and courses as in-service training for teachers at all levels of the educational system (e.g. Prolog and Mathematica, the computer in process writing and applications in primary schools).

SkolSNIC also runs the national electronic conference SkolKOM.

Products:

The complete projects are sold by the Centre to schools all over the country on a non-profit basis. Final report May 1991.

UNIVERSITY OF UPPSALA
COMPUTING SCIENCE DEPARTMENT

Title of project: ANALYZE MORE – AN EXPERT SYSTEM FOR ENVIRONMENT PROTECTION

Person to contact: Anneli Edman
Computing Science Department
University of Uppsala
PO Box 520
751 20 - Uppsala, Sweden
Tel. 46 18 18 25 00 – Fax: 46 18 52 12 70

Duration: Ongoing from summer 1990.

Funding: National Board of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In upper secondary education:

- To introduce the use of new information technologies in schools, and in particular, to design an expert system for environmental education.

Implementation:

Analyse More is a computer expert-system created at the University as a support for students in sampling and evaluating the quality of water in lakes. It covers several school subjects: geography, physics, chemistry and biology, and builds on expert knowledge from the National Swedish Environment Protection Board.

Both experts and teachers contribute with testing methods.

Most practical work was carried out by undergraduate students under the supervision of a university teacher/researcher. Project meetings took place, alternating between the University and the National Board of Education.

The project was initiated by the National Board of Education, which is an educational policy-making body.

Products:

A first prototype will be tested in schools during Autumn 1991.

Presented at the PEG91 (Prolog Education Group) Conference in Rapallo, Italy.

UNIVERSITY OF UPPSALA
COMPUTING SCIENCE DEPARTMENT

Title of project: FIVE KBS APPLICATIONS

Person to contact: Anneli Edman
Computing Science Department
University of Uppsala
PO Box 520
751 20 - Uppsala, Sweden
Tel. 46 18 18 25 00 – Fax: 46 18 52 12 70

Duration: From October 1988 to October 1990

Funding: National Board of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In upper secondary education:

- To analyse KBS applications.

Implementation:

Two of five planned KBS applications are under way:

- A knowledge-based system for problem solving in mathematics;
- A criticising system for a problem area in social science that is considered difficult to formalise, viz. the right to asylum for political refugees. Most practical work was carried out by undergraduate students under the supervision of a university teacher/researcher. Project meetings took place, alternating between the University and the National Board of Education.

The project was initiated by the National Board of Education, which is an educational policy-making body.

Products:

Presented at the PEG89 (Prolog Education Group) Conference in Uppsala, hosted by the Department and at the PEG91 Conference in Rapallo, Italy.

UNIVERSITY OF UPPSALA
COMPUTING SCIENCE DEPARTMENT

Title of project: PROLOG-O – A PROGRAMMING ENVIRONMENT FOR CHILDREN

Person to contact: Kristina Hook Jansson
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Tel. 46 18 18 25 00 – Fax: 46 18 52 12 70

Duration: From 1986 to 1988

Funding: National Board of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In one primary school (intermediate level):

– To introduce the Prolog programming language.

Implementation:

All school subjects were covered by the project. The children made animated films by making simple computer programs.

Most practical work was carried out by undergraduate students under the supervision of a university teacher/researcher. Project meetings took place, alternating between the University and the National Board of Education.

The project was initiated by the National Board of Education, which is an educational policy-making body.

The Department hosted the Prolog Education Group (PEG89) Conference in Uppsala in June 1989.

Products:

Report at 3rd International Conference on "AI and Education", Pittsburgh, PA, 1987 and at Apple's 3rd International Symposium, Pisa, Italy, 1987.

UNIVERSITY OF UPPSALA
DEPARTMENT OF TEACHER TRAINING

Title of project: ANALYSIS OF THE CONSEQUENCES OF COMPUTERS FOR MATHEMATICS EDUCATION (ADM-PROJECT)

Person to contact: Hans Brolin
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Tel. 46 18 18 25 00 – Fax: 46 18 18 24 00

Duration: From July 1986 to June 1990

Funding:
- University of Uppsala
- Ministry of Education
- National Board of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In 50 upper secondary schools all over the country:

- To study the role of the computer in mathematics education and, in particular, to analyse the contribution of toolkit programs to changes in traditional teaching methods (i.e. how computers can be utilised to contribute towards: a) an improved understanding of concepts and relationships, and b) better problem-solving ability);
- To provide students before leaving school with the opportunity to discover and learn the use of the powerful computing devices available today in mathematics.

Implementation:

The experience gained in the project has concluded that mathematical toolkits enable the study of problems of great complexity by executing routine calculation and allowing the students to understand concepts.

The project has initiated experimental teaching in different sub-projects studying advanced program software in classroom situations and determining what modifications this software might bring about in the teaching of mathematics: study of functions; differential equations; analysis of data; mathematics and logic using Prolog. This enables students to develop the ability to: apply their mathematics in new situations (formulate and solve problems); discuss mathematical problems; carry out a mathematical argument and critically evaluate results.

Products:

The results of this project have been used in the National three-year Project Computers in Education, started in 1988. Final report October 1990.

UNIVERSITY OF UPPSALA
DEPARTMENT OF TEACHER TRAINING

Title of project: THE ROUND BOOK - THE TEXTBOOK OF THE FUTURE

Person to contact: Arne Lindquist
Interactive Media Group
Department of Teacher Training
University of Uppsala
Box 2136
750 02 - Uppsala, Sweden
Tel. 46 18 18 24 65 – Fax: 46 18 18 24 00

Duration: From July 1987 to July 1991

Funding:
- University of Uppsala
- Central Board of Higher Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In four schools, lower and upper secondary, in social sciences:

- To develop databases on CD-ROM with text and numerical information of interest for teachers and students.

Implementation:

The databases contain the following:

- The Swedish Parliament Private Bills and Proceedings in full text;
- The programs of the Swedish political parties in full text;
- The Third World Guide of the World in full text;
- A student career database;
- Statistical databases, including a graphical user-interface and a mapping program, containing numerical data of the Swedish and the Nordic communes, the countries of the world, etc.

Only text databases on CD-ROM are being produced, but interactive databases with pictures and sound are planned.

There is a Nordic reference group with representatives for Norway, Sweden, Finland, Iceland and Denmark, meeting approximately two or three times a year.

Products:

Approximatly 100 schools are testing the databases (without being directly involved in the project).

Final report July 1991.

Switzerland

University of Bern
University of Fribourg
University of Geneva

UNIVERSITY OF BERN
INSTITUTE OF EDUCATIONAL PSYCHOLOGY AND DIDACTICS

Title of project: THE CLASSROOM USE OF AN INTELLIGENT TUTORING SYSTEM IN MATHEMATICS

Person to contact: Kurt Reusser
Institute of Educational Psychology and Didactics
University of Bern
Muesmattstrasse 27
P.O. Box
3000 - Bern 9, Switzerland

Duration: From April 1989 to April 1992

Funding:
- Swiss National Science Foundation
- University of Berne

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In several schools, primary and lower secondary located near Berne:

- To gather data about the use in mathematics of an Intelligent Tutoring System in a clasroom setting;
- To carry out an efficiency and sufficiency test of the computer tutor.

Implementation:

An Intelligent Tutoring System (HERON), based on didactical and educational theories and work on cognitive simulation, helps students to solve relatively complex mathematical problems. More specifically, it is designed to aid children in analysing natural language problem texts and in building mathematical problem models. This is done by means of several kinds of didactic strategies and representational formats. HERON can be seen as a fancy blackboard for text comprehension and mathematisation with directly manipulable objects. It maximises the student's sense of control and the degree to which solutions are self-generated.

The project examines both the efficiency of the program and its social-cognitive and didactical implementation in normal classrooms.

Products:

The computer tutor will be provided for the teachers in a number of classes (which do not participate in the intervention study) for about half a year.

Final report May 1992.

UNIVERSITY OF FRIBOURG
INSTITUTE OF PSYCHOLOGY AND PEDAGOGY

Title of project: THE USE OF COMPUTERS IN EDUCATION – A TRANSDISCIPLINARY APPROACH

Person to contact: Bruno Vitale
Institute of Educational Sciences
University of Fribourg
1701 - Fribourg, Switzerland
Tel. 41 22 782 5018

Duration: Ongoing from 1988

Funding:
- Centre for Research in Educational Psychology, Department of Education, Geneva

Associated Universities:
- University of Geneva (Science Teaching and Epistemology Laboratory), Switzerland
- University of Naples (Institute of Theoretical Physics), Italy

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two pilot 8th grade (lower secondary) classes, which have already received some basic instruction in computers in the 7th grade (LOGOwriter):

- To explore, with the two teachers concerned, the development of the concepts of change and growth in a number of very different areas (e.g. pupils' height and weight, population changes in a town, bacterial or fungal colonies, etc.).

Implementation:

The teaching/learning process comprises several phases: data gathering, description and qualitatve notation, construction of a local model and programming in LOGOwriter. Subsequently, the local model is refined with the help of the computer and the computer procedures used are discussed by everyone involved.

Products:

A publication by B. Vitale: "L'intégration de l'informatique a la pratique pédagogique" (Vol. 1: Considérations générales pour une approache transdisiplinaire) and (Vol. 2: Les Projets: Cahier I. Jeux; Cahier II. Arbres et arborescences; Cahier III. Croissance et changement – *in preparation*), CRPP-DIP, Geneva 1990.

UNIVERSITY OF GENEVA

FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
TRAINING TECHNOLOGIES AND LEARNING

Title of project: TRAINING TEACHERS IN THE EDUCATIONAL USES OF THE COMPUTER

Person to contact: Patrick Mendelsohn
TECFA, Faculty of Psychology and Educational Sciences
University of Genève
24, rue Général-Dufour
1211 - Genève 4, Switzerland
Tel. 41 22 705 7485 – Fax: 41 22 20 29 27

Duration: Ongoing from 1990

Funding: University of Geneva

Associated Universities:
- University of Grenoble I Joseph Fourier, France
- University of Lancaster, Computing Department, Royaume-Uni.

BRIEF DESCRIPTION OF THE PROJECT

Aims:

The University of Geneva co-operates closely with the Centre for Computer Assisted Instruction of the Department of Education in Geneva. This Centre covers the different levels of education, i.e. primary, secondary and technical. The purpose of these co-operative projects is to train teachers in the educational uses of the computer.

Implementation:

The University and the CAI Centre run a series of seminars on such subjects as learning environments, the role of word processing, the use of computers in relation to the written word "intelligent reading techniques as a prerequisite for basic learning", effective use of the computer in the classroom. The University is involved in the areas of cognitive psychology, educational sciences, artificial intelligence and learning environments. The START-UP Project of the DELTA Programme of the Commission of the European Communities is also involved in certain of these activities.

Dates for the seminars and details regarding participation in these courses are decided at the start of the academic year.

Products:

- Development of learning environments
- Scientifics publications

Turkey

Cukurova University
Ege University (2)
Middle East Technical University

CUKUROVA UNIVERSITY
DEPARTMENT OF PHYSICS

Title of project: INTRODUCING INFORMATICS INTO SCHOOLS

Person to contact: Gülsen Onengüt
Department of Physics
Cukurova University
Fen-Edebiyat Fakültesi
01330 Adana, Turkey
Tel. 90 71 326 084 – Fax: 90 71 326 070

Duration: From September 1990 to June 1992

Funding:
- The Universities
- UNESCO pilot project
- German Society for Joint Technical Projects (GTZ)

Associated Universities:
- Istanbul Technical University (Department of Physics)
- Middle East Technical University (Department of Physics)

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To integrate microcomputer-aided learning methods at all levels of education. Microcomputer-based laboratories and general purpose programs like word processing, spreadsheets and databases are the main applications for educational purposes.

Implementation:

Three universities have joined forces to start a co-operative project with a private school covering pre-primary to upper secondary education levels. Under the guidance of the researchers from the university, the school has been equipped with a resource room containing 16 computers.

Interested teachers can use this room for presenting CAL material in their course and laboratory work. The researchers from the universities will act as advisors for all these activities. They will work with the teachers both at the university, trying to get them involved in the production of CAL materials, and at the school while they are using this material with the students.

Products:

Efficient teacher training for using Computer-Aided Learning, interfaces and software for the science laboratory.

EGE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Title of project: COMPUTERS IN PRIMARY SCHOOL

Person to contact: Emrah Orhun
Bilgisayar Mühendisligi Bölumü
Ege University
Bornova, Izmir, Turkey
Tel. 90 51 181 080 – Fax: 90 51 187 230

Duration: From 1989 to 1992

Funding:
- Ege University Research Fund
- Centre for Computer Research and Application, Ege University

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To introduce primary school children (age 8, third year) to the use of information technology as a tool;
- To develop computer-based learning environments.

Implementation:

A Turkish version of LOGO programming language was used in two primary schools. Activity worksheets were prepared to direct the work of the children. A 9-week workshop was organised with 12 teachers to discuss the integration of the activities into the curriculum.

Products:

The cognitive effects of LOGO learning were studied, using pre- and post-tests. A teacher's guide and an activity notebook have been prepared. The experiment will be repeated during 1991-92.

Final report in September 1991.

EGE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Title of project: COMPUTER-BASED SUPPORT ENVIRONMENT FOR INSTRUCTIONAL DESIGN

Person to contact: Emrah Orhun
Bilgisayar Mühendisligi Bölumü
Ege University
Bornova, Izmir, Turkey
Tel. 90 51 181 080 – Fax: 90 51 187 230

Duration: From 1989 to 1992

Funding:
- Ege University Research Fund
- Centre for Computer Research and Application, Ege University

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To develop a computer-based support environment for instructional design;
- To develop instructional materials for a computer literacy course for teachers.

Implementation:

Two PhD and two MSc thesis projects have been defined in order to investigate learning with hypertext and to develop a computer-based support environment for instructional design.

Products:

Research papers have been written which discuss issues in learning with hypertext and in instructional hypertext design. Samples of instructional material have been developed for a computer literacy course.

Final product and report end 1992.

MIDDLE EAST TECHNICAL UNIVERSITY
FACULTY OF EDUCATION

Title of project: COURSEWARE DEVELOPMENT AND TEACHER TRAINING

Person to contact: Hasan Güran
Faculty of Education
Middle East Technical University
Balgat
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Tel. 90 41 223 8491 – Fax: 90 41 223 84 91

Duration: From December 1988 to July 1989

Funding:
- The Scientific and Technical Research Council of Turkey
- The Ankara Electronic Research and Development Institute
- HEMA Electronic (by providing computers)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

- To develop courseware packages based on the Turkish Curriculum and to train the selected teachers to write and design appropriate scenarios for the courseware;
- To train all teachers in the school in computer-assisted instruction;
- To obtain feedback about the courseware, its applications and teacher training.

Implementation:

The Ankara Anadolu Lycée (upper secondary education level) was chosen as a pilot institution to implement these aims. The subject matters concerned were mathematics, chemistry, biology and physics.

Products:

The project was carried out under the control of the Ministry of Education. Its results were therefore very important for education policy-makers.

The Queen's University of Belfast (3)
University of East Anglia (3)
University of Exeter
University of Leeds
University of London (3)
University of Sussex (2)
West Sussex Institute of Higher Education
College of St Mark and St John, Plymouth

THE QUEEN'S UNIVERSITY OF BELFAST
SCHOOL OF EDUCATION

Title of project: SUPER SHOPPER – A CONSUMER AWARENESS COMPUTER BASED LEARNING PACKAGE FOR PRIMARY SCHOOLS

Person to contact: John Gardner
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The Queen's University of Belfast
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Belfast BT7 IHL, Northern Ireland

Tel. 44 232 245 133 – Fax: 44 232 247 895

Duration: From January to November 1989

Funding:
- General Consumer Council for Northern Ireland
- The Queen's University of Belfast

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In two primary schools:

- To find a computer-based means to present consumer issues to young primary school children;
- To promote economic awareness in pupils.

Implementation:

The project was initiated by the General Consumer Council. The University then identified the schools, teachers and pupils to be involved. A games approach was proposed and piloted with the schools involved. After a process of re-design and refinement, a prototype package was developed. This was piloted and, with modifications, was adopted.

The final package included paper-based and computer based materials centering on the hypothetical spending undertaken in a week in a pupils' life.

Meetings were held fortnightly, with trialling in schools once a month.

Products:

A teaching package which was disseminated through the five education and library boards (local education authorities)

Final report November 1989.

THE QUEEN'S UNIVERSITY OF BELFAST
SCHOOL OF EDUCATION

Title of project: ECODISK - A CROSS-CURRICULAR APPROACH TO BRIDGING THE PRIMARY-SECONDARY TRANSFER GAP IN SCHOOLS

Person to contact: John Gardner
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Tel. 44 232 245 133 – Fax: 44 232 247 895

Duration: From March 1990 to March 1992

Funding:
- South Eastern Education and Library Board (SEELB)
- Apple UK

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In four schools, a central secondary school and three "feeder" primary schools:

- To examine how an educational theme (environmental education), developed in both primary and secondary schools, can provide a continuity of experience for pupils leaving primary and going into secondary-level schools.

Implementation:

The project is centred on the use of a CD-ROM disk, called Ecodisk, recently made available by the BBC. This is a re-working of a laser vision disk for interactive video. The material has been augmented both in terms of the textual material and also in the language of presentation (nine European languages are incoporated). Much of the material already exists, but both staff and pupils are being encouraged to create new materials.

The content of the disk is an ecological survey of a nature reserve, Slapton Leigh, in Southern England. The teaching materials centre on rôle-play activities where the pupils assume the rôles of people representing different groups with an interest in the site. These groups have contrasting and often conflicting requirements and include several clubs: a water-ski club, a fishing club, a birdwatchers' group, and so on.

The University's project input is largely advisory and evaluative. The work is being monitored both in terms of the materials being developed and the teaching/learning experiences involved.

Products:

Final report 1992

THE QUEEN'S UNIVERSITY OF BELFAST
SCHOOL OF EDUCATION

Title of project: PUPILS' LEARNING AND ACCESS TO INFORMATION TECHNOLOGY PROJECT (PLAIT)

Person to contact: John Gardner
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Tel. 44 232 245 133 – Fax: 44 232 247 895

Duration: April 1991 to December 1992

Funding: Department of Education for Northern Ireland

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In nine primary and secondary schools (250 pupils):

- To examine the potential of "laptop" computers to assist in delivering the information technology requirements of the National Curriculum at the four key stages of a child's education (5-16 years);
- To study in depth the implications for change in teaching/learning approaches, classroom organisation and school resourcing

Implementation:

Each pupil has a "laptop" computer. These will become the personal educational tools of these pupils, whose development and perfomance will be measured over the following year.

Each school will assume primary responsibility for work in one of the main areas proposed, i.e. one school will do key stage 3 mathematics, another will look at key stage 1 writing and so on. Each school will also be providing activities for the chosen pupils across the curriculum.

The teachers in schools will be engaged in action research for Masters or higher degrees for which evaluative research and quantitative measurements are conducted by the University team. They will be able to choose between a taught modular degree or a full research degree. Their fees will be paid.

Products:

The project is being promoted as a "policy-informing" piece of research. The Department of Education for Northern Ireland will act upon the findings when allocating research funds for schools.

Final report December 1992.

UNIVERSITY OF EAST ANGLIA
CENTRE FOR APPLIED RESEARCH IN EDUCATION

Title of project: INITIAL TEACHER EDUCATION AND NEW TECHNOLOGY (PROJECT INTENT)

Person to contact:

Bridget Somekh
Co-ordinator of Project INTENT
Centre for Applied Research in Education
University of East Anglia
Norwich NR4 7TJ, United Kingdom

Tel. 44 603 561 161 – Fax: 44 603 259 388

Duration: From September 1990 to September 1992

Funding: National Council for Educational Technology

Associated Universities: – University of Exeter; Goldsmith College; University of London; Liverpool Polytechnic; Chester College of Higher Education; and Worcester College of Higher Education

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To support and monitor the implementation of institutional policies for Information Technology. The Project is primarily concerned with:

1. Developing the quality of teaching and learning with Information Technology;
2. Providing support for lecturers integrating Information Technology across the curriculum for initial teacher training;
3. Developing management strategies to enable (1) and (2) above;
4. Monitoring the processes of institutional change.

Implementation:

The INTENT central team is made up of senior managers and staff development tutors for IT in each Institution who are working with colleagues, students and local teachers to bring about the necessary institutional change at all levels.

INTENT has an educational rather than a technological focus, and is adopting a research approach to development, believing research and formative evaluation to be essential components of successful development work.

A number of primary and secondary schools are involved through the work of students on teaching practice.

Products:

Case studies and associated research reports will be prepared. There will be an emphasis on sharing the practical and theoretical findings of the Project with colleagues in other Initial Teacher Training Establishments. In the second year of the project, an evaluation of the strategies developed will be produced.

UNIVERSITY OF EAST ANGLIA
CENTRE FOR APPLIED RESEARCH IN EDUCATION

Title of project: PALM: PUPIL AUTONOMY IN LEARNING WITH MICROCOMPUTERS

Person to contact: Bridget Somekh
Centre for Applied Research in Education
University of East Anglia
Norwich NR4 7TJ, United Kingdom
Tel. 44 603 561 161 – Fax: 44 603 259 388

Duration: From September 1988 to August 1990

Funding:
- National Council for Educational Technology
- Local Education Authorities

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In twenty four primary and lower secondary (and some upper secondary) schools.

- To work in partnership with teachers to research the role of Information Technology in developing pupil autonomy in learning;
- To investigate the effectiveness of action-research as a means of teacher professional development in the Information Technology innovation.

Implementation:

PALM adopted an action-research approach which invited participant teachers to carry out research and curriculum development in the use of computers in education. Central team members participated in the research in classrooms and schools, collecting evidence of students' learning through classroom observation, as well as researching their own roles supporting teachers and students. Through a process of analysing and reflecting on the data, the teacher-researchers evaluated the learning taking place and planned for future lessons using computers, building in any changes they considered desirable to improve the quality of learning. In many cases, students played an important part in this research process either as informants or co-researchers.

Products:

Publications: *"Teachers' Voices"* (series presenting teachers' accounts of their research - 40 separate titles) and *"Supporting Teacher Development Through Action Research"*; a pack for advisory teachers. Palmleaves Newsletter during the project (six issues). Shared Perspectives (in preparation) to draw out themes and issues and present an overview of PALM work. PALM: The Inside Story, an account of how the project was set up and how it worked.

UNIVERSITY OF EAST ANGLIA
CENTRE FOR APPLIED RESEARCH IN EDUCATION

Title of project:	**PALM: PUPIL AUTONOMY IN LEARNING WITH MICROCOMPUTERS (Extension Project)**
Person to contact:	Richard Davies Centre for Applied Research in Education University of East Anglia Norwich NR4 7TJ, United Kingdom Tel. 44 603 561 161 – Fax: 44 603 259 388
Duration:	From September 1990 to March 1991
Funding:	National Council for Educational Technology
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

The PALM Extension Project has been set up following the success of PALM phase one. It is a feasibility study leading to a possible PALM Three from April 1991.

Aims:

In primary and secondary schools (to be identified), three aims will be pursued:

- To work in partnership with teachers to research the role of Information Technology in developing pupil autonomy in learning (as PALM phase one);
- To investigate the effectiveness of action research as a means of teacher professional development in the Information Technology innovation (as PALM phase one);
- To explore to what extent PALM's methods can be integrated within the existing support structures for Information Technology in Local Education Authorities.

Implementation:

The Extension project builds on advisory teachers' existing expertise in supporting teachers. In order to obtain a high level of commitment, it was stipulated that all advisory teachers chose to join. Action research methods are introduced as appropriate, in consultation. This involves collecting data (using simple procedures such as interviewing, observing and journal writting) and using these as the basis for reflecting on practice and introducing any necessary changes. The project is not prescriptive in methodology but works within the guidelines of the PALM operating philosophy developed in the first phase of the project.

Products:

The final report will take the form of a proposal for further funding during the spring of 1991.

UNIVERSITY OF EXETER
SCHOOL OF EDUCATION

Title of project: HEALTH EDUCATION THROUGH INFORMATION TECHNOLOGY

Person to contact: Niki Davies
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University of Exeter
Exeter, Devon EX1 2LU, United Kingdom
Tel. 44 392 264 727 – Fax: 44 392 264 736

Duration: From March 1990 to March 1992

Funding:
- University of Exeter, School of Education
- Health Education Authority
- Schools

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

To develop a software package on Health Education directly related to two cross curriculum issues in secondary education: Personal and Social Education and Information Technology . Two secondary schools were involved at the beginning of the project. All the secondary schools in the East Devon Health Authority are now participating.

Implementation:

The National Curriculum emphasises the cross curricular nature of Information Technology.

The software package developed contains data files for use in schools in their software and hardware. Teaching materials are cross referenced to other support material for alcohol education. Other areas of the National Curriculum may also be considered where they arise. In particular pupils, may be stimulated to develop their own questionnaires and look at mathematical aspects of handling data.

Products:

Very little data on the cross-curricular use of technology is available. It is proposed in the next phase to evaluate the teaching programme. Two software packages and curriculum materials: (1) for schools, (2) for pre-service teachers.

UNIVERSITY OF LEEDS
SCHOOL OF EDUCATION

Title of project: CONCEPTUAL CHANGE IN SCIENCE

Person to contact: Rosalind Driver, R. Hartley
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University of Leeds
Leeds, LS2 9JT, United Kingdom
Tel. 44 532 334 675 – Fax: 44 532 334 683

Duration: From 1988 to 1991

Funding:
- Economic and Social Research Council
  InTER Programme

Associated Universities:
- Glasgow University
- Open University

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five lower secondary schools:

- To clarify and describe the process of change in the learners' conceptual understanding of natural phenomena;
- To develop and evaluate computer software which may be useful in exporing childrens' reasoning and promoting conceptual change in the domain of reasoning in mechanics.

Implementation:

The domain of reasoning in mechanics has been selected for study. The project considers that children seeking to understand and explain physical phenomena they encounter in the real world construct mental models of how the world behaves.

Two software systems have been developed to address childrens' prior conceptions. Both have been written in SMALL TALK. One program, called DM3 (Direct Manipulation of Mechanics Microworlds) is an interactive simulation of motion under force, allowing students to observe and manipulate both informally and in a structured experimental manner the behaviour of objects in motion. The other system, VARILAB, allows children to understand and develop views of physics. It enables students to build (graphically) small bodies and agents that act on them and runs dynamically showing changes (in speed, say, through time). The system itself is designed to point out inconsistencies and reasons if it is unable to "run" and illustrate an event.

Products:

The development and trial of software and the observation of pedagogical strategies appropriate to promoting the conceptual change process.

UNIVERSITY OF LONDON
INSTITUTE OF EDUCATION

Title of Project:	**A COMPUTER-BASED IN-SERVICE PROGRAMME FOR SECONDARY MATHEMATICS: THE MICROWORLDS PROJECT**
Person to contact:	Celia Hoyles Department of Mathematics, Statistics and Computing Institute of Education University of London 20 Bedford Way London WC1H OAL, United Kingdom Tel. 44 71 636 15 00 – Fax: 44 71 436 21 86
Duration:	From November 1986 to October 1989
Funding:	– Economic and Social Research Council – Local Education Authorities
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In three lower secondary schools:

- To develop, implement and evaluate a programme of in-service teacher education concerned with the use of generic computer applications within the secondary school mathematics curriculum.

Implementation:

The programme was designed to encourage teachers to: develop ways of structuring the computer environment within their mathematics classrooms and evaluate its role in terms of pupils' learning; design and implement a computer-based microworld for a specific area of the mathematics curriculum; reflect on their own learning processes and relate these to the learning of the pupils within their classrooms; confront the issues relating to the computer's influence on the role of the teacher, and to increase awareness of pupil learning styles; develop dissemination procedures within the school mathematics department.

Two 30-day in-service teacher training courses were held, over two years. They were evaluated from the point of view of the course itself and from the perspective of the teachers. In the third year, a computer-based microworld (the "Ratio and Proportion Microworld") was developed and evaluated. Software used was mainly LOGO, spreadsheets (EXCEL) with databases and graph plotting packages.

Some of the findings of the work influenced Information Technology and Education policy at n: tional level.

Products:

Final report January 1990

UNIVERSITY OF LONDON
INSTITUTE OF EDUCATION

Title of project: COMPUTER BASED MODELLING ACROSS THE CURRICULUM

Person to contact: Celia Hoyles
Department of Mathematics, Statistics and Computing
Institute of Education
University of London
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London WC1H OAL, United Kingdom
Tel. 44 71 636 15 00 – Fax: 44 71 436 21 86

Duration: From April 1989 to March 1992

Funding: Government Training Agency

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five lower and upper secondary schools:

- To focus on the use of the computer as a tool for modelling in a variety of subjects - initially mathematics, business studies, science and geography - and cross-curricular activities;
- To facilitate understanding of human and physical systems by providing tools which allow a quantitative perspective;
- To use modelling with teachers in order to develop curriculum materials for classroom use which will also serve as vehicles for staff development.

Implementation:

Many industrial applications use computer modelling and the project will encourage the same collaborative styles of working in the classroom that are often used in industry. The main features of the project will be: to enhance aspects of the current curriculum which involve the modelling of physical and human systems; to construct and use models with the same generic software (e.g. spreadsheets) within the context of the different subjects and through cross-curricular acivities; to develop independent and group learning; to design and evaluate materials for teacher development; to disseminate materials within and beyond the Chiltern Region.

The Project is developed in co-operation with five Local Education Authorities and the Advisory Unit for Microtechnology in Education.

Products:

Final report April 1992.

UNIVERSITY OF LONDON
INSTITUTE OF EDUCATION

Title of Project: GROUPWORK WITH COMPUTERS

Person to contact: Celia Hoyles
Department of Mathematics, Statistics and Computing
Institute of Education
University of London
20 Bedford Way
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Tel. 44 71 636 15 00 – Fax: 44 71 436 21 86

Duration: From September 1988 to December 1991

Funding: Economic and Social Research Council

Associated Universities: University of Sussex

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six primary and lower secondary schools located in Bedfordshire, Essex and Middlesex:

- To learn, as teachers, how to exploit rather than ignore the potential of working in groups with computers (groupwork);
- To assess the potential of group work for the enhancement of learning;
- To identify the learning goals and tasks for which groupwork is likely to be more effective.

Implementation:

The project attempts to throw light on the general problematic of effective groupwork with computers. Scarcity of computers is likely to make working in groups a practical necessity for many years ahead. The main issues are:

- For what types of learning goal is groupwork with computers most appropriate?
- What is the potential contribution to the curriculum?
- How can computer and non-computer based tasks be designed for groupwork?
- Is it possible to identify criteria for task design, group management and their interrelationships, for effective groupwork to be established?
- What kinds of groups are best for achieving particular goals?
- How can such groupwork best be prepared for, implemented and evaluated?
- Is training in groupwork a significant advantage?

The associated University of Sussex focuses on macro issues and the University of London Institute of Education on micro issues.

Products:

Final report February 1992.

COLLEGE OF ST. MARK AND ST. JOHN
CENTRE FOR INFORMATION TECHNOLOGY IN EDUCATION

Title of project:	AN EXEMPLAR OF PROGRESSION IN INFORMATION TECHNOLOGY THROUGH A CROSS–CURRICULAR THEME
Person to contact:	John Coupland Centre for Information Technology in Education College of St. Mark and St. John, Derriford Road, Plymouth PL6 8BH, United Kingdom Tel. 44 752 761 104 – Fax: 44 752 761 123
Duration:	From April 1990 to March 1992
Funding:	Department of Education and Science
Associated Universities:	None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In five schools (2 primary, 3 secondary) to support teachers in:

1. Pursuing the development of IT capability in the context of a cross- curricular theme, environmental education (water);
2. The integration of IT into the curriculum;
3. Identifying progression in IT by use of a single IT package in complex situations (Excel);
4. To develop a teacher programme usable in addressing clusters of the attainment targets of the National Curriculum.

Implementation:

Exemplars will be provided, for three of the key age stages of the National Curriculum [Key Stage 2 (8-11), Key Stage 3 (12-14) and Key Stage 4 (15-16)]. Excel will be configured to provide three levels of access appropriate to each of the key stages 2, 3, and 4.

A range of statements of attainment will be addressed from the published documents in English, Mathematics, Science, Technology, Geography. Analysis of these documents indicates clusters of statements relating to this topic fall into two groups: a) Skills and, b) Knowledge and concepts.

Products:

Support materials for the following groups will be developed: Pupils; Teachers; In-service providers; Initial teacher trainers. For each of the key stages, these stand alone materials will clearly indicate the cross-curricular links provided by environmental education.

UNIVERSITY OF SUSSEX
INSTITUTE OF CONTINUING AND PROFESSIONAL EDUCATION

Title of project: WHOLE SCHOOL DEVELOMMENT IN INFORMATION TECHNOLOGY

Person to contact: Michael Eraut
Institute of Continuing and Professional Education
Education Development Building
University of Sussex
Falmer, Brighton BN1 9RG, United Kingdom
Tel. 44 273 67 80 39 – Fax: 44 273 67 84 66

Duration: From October 1988 to September 1991

Funding:
- Employment Department Group's Training Agency
- Training, Enterprise and Education Directorate of the Employment Department Group

Associated Universities: Brighton Polytechnic

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In sixteen secondary schools:

- To deve op and disseminate in-service teacher training strategies and materials of proven effectiveness in information technologies in the following areas:
  1. Whole school policies for information technology;
  2. School management of information technology;
  3. School focused staff development in information technology.

Implementation:

The project represents an advanced stage in the evolution of information technology in schools, in placing importance on developing whole school policies which would not only state aims, but also provide plans and targets for action. Such a policy would cover the currriculum, school administration, resource management, finance and staff development. The team explores means of constructing and implementing such a pol · ·ffering ideas and approaches drawn from previous experience and contributing expertise in curriculum develoment, whole school review and methods of self evaluation. Supporting materials were tested and modified within schools and on courses.

Products:

Shared accounts of how a school policy evolves will contribute to a map of policy options which will guide other schools' decisions.

Final report September 1991.

Publications: Decisions Guide 3 IT Policy Papers (January 1991). Videotape *"Getting IT Right"* (April 1991).

UNIVERSITY OF SUSSEX
INSTITUTE OF CONTINUING AND PROFESSIONAL EDUCATION

Title of project: GROUPWORK WITH COMPUTERS

Person to contact: Michael Eraut
Institute of Continuing and Professional Education
Education Development Building
University of Sussex
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Tel. 44 273 67 80 39 – Fax: 44 273 67 84 66

Duration: From September 1988 to December 1991

Funding:
- Economic and Social Research Council
- Local Education Authorities

Associated Universities: University of London, Institute of Education

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six primary schools (9-12 years), located in West Sussex, East Sussex and Surrey:

- To assess the potential of groupwork for the enhancement of learning;
- To identify the learning goals and tasks for which groupwork is likely to be more effective;
- To study the teacher's role in planning, supporting and assessing groupwork.

Implementation:

The project addresses the general problem of effective groupwork with computers, making use of teacher researchers in schools. Each school has a paid teacher research and teacher practitioner, with the researcher being given release time to observe the use of computers in the practitioner's classroom. After an initial training period for all the project teachers, the work is supported by a research fellow who makes regular visits and also collects data in the same classrooms. Meetings to coordinate the work, share experience and discuss meta-analyses of findings are held termly.

Products:

Case study reports by teacher researchers and the research fellow were published in November 1990; and a further set are due in November 1991.

The final report shoud be complete by February 1992.

WEST SUSSEX INSTITUTE OF HIGHER EDUCATION
MATHEMATICS CENTRE

Title of project: DEVELOPING MATHEMATICS WITH MICROCOMPUTERS

Person to contact: Adrian Oldknow
Mathematics Centre
West Sussex Institute of Higher Education
Upper Bognor Road
Bognor Regis
Sussex, PO21 IHR, United Kingdom

Duration: Ongoing

Funding:
- Staffing by: Department of Education and Science; Microelectronics Education Project; Training Agency; Nuffield Trust
- Hardware by: National Advisory Body; Department of Trade and Industry

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In six schools (primary, lower secondary and upper secondary), in the use of computers in mathematics, information technology, special needs and science:

- To improve access to information technologies for teachers and students;
- To develop teachers' professional ability;
- To develop fluency and discrimination in the use of computers in mathematics.

Implementation:

This is not one single project but a continuing synthesis of a number of projects, reflecting matters of concern both nationally and to the Centre. Research into the use of IT in mathematics has been conducted for low-attaining pupils within the LAMP (Low Attainers in Mathematics Project). The Centre had taken its own development aims from these researches.

The Centre had initiated a variety of in-service programmes for teachers ranging from one term full-time, to twenty days over a school year, as well as producing curriculum developments in the uses of information technology in initial teacher training. These have focused on the changing nature of mathematics itself because of the impact on IT and on different models of student learning and interaction.

Current activity is focused on the role of information technologies with new courses of A-level mathematics (16-19 years) with the Nuffield Advanced Mathematics Project.

Products:

Material and programs to fit the national curriculum.

United States

Arizona State University
Columbia University
University of Illinois
University of Maryland
University of Pittsburgh

ARIZONA STATE UNIVERSITY
TECHNOLOGY BASED LEARNING AND RESEARCH

Title of project: TEACHING MATHEMATICS METHODS USING INTERACTIVE VIDEODISC

Person to contact: Gary G. Bitter
Technology Based Learning and Research
Arizona State University
Payne 148
Tempe, Arizona 85287-0111, United States
Tel. 1 602 965 3322 – Fax: 1 602 965 8887

Duration: From 1989 to 1991

Funding:
- National Science Foundation
- IBM (equipment)

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In primary and middle schools (Grades K-8) of Tempe:

- To improve elementary mathematics instruction.

Implementation:

This goal is accomplished by the development of an interactive videodisc instructional program that will more effectively prepare pre-service teachers to integrate content, manipulative devices, and methods in their mathematics teaching.

The program provides a unique opportunity to observe and analyze model teaching and student behaviour in actual classrooms, a virtual field experience. It will be used by university professors to demonstrate exemplary math teaching methods to pre-service teachers, and by the pre-service teachers themselves for individual and group study. Sophisticated database indexing allows users to access segments according to flexible selection criteria.

The program includes a university professor modeling mathematics instruction using manipulative devices (base 10 blocks or geoboard), and exemplary elementary teachers using these manipulatives with their first, third, or fifth grade students. These segments show classroom experiences of large group instruction, cooperative and peer group learning, and individualized learning.

The formative evaluation of the instructional program emphasizes qualitative data collection and analysis, primarily interviews with preservice teachers after their initial period of exposure to the program. The summative evaluation emphasizes differences in cognitive gain, attitude, and classroom behaviour of groups of preservice teachers differentially exposed to the program.

Products:

Final report 1992.

COLUMBIA UNIVERSITY
TEACHERS COLLEGE

Title of project: ELECTRONIC LEARNING LABORATORY

Person to contact:
Mary Alice White
Teachers College, Electronic Learning Laboratory
Colombia University
Box 426
158 Taconic Road
Salisbury, CT 06068, United States
Tel. 1 203 435 9121 – Fax: 1 203 135 8160

Duration: Ongoing from 1982

Funding:
- University
- Private sector

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In pre-primary, primary, lower and upper secondary public schools in Connecticut and in the United Nations school in New York:

- To evaluate new product software;
- To analyse the use of technologies in education.

Implementation:

The Laboratory carries out a range of projects: empirical research on the new technologies in schools; evaluation of software products in development: evaluating existing software; publication of articles on the uses of technologies in education; raising policy issues.

Products:

Published articles.

UNIVERSITY OF ILLINOIS
COLLEGE OF EDUCATION

Title of project: URBANA YEAR-LONG PROJECT

Person to contact: Sheryl Benson
College of Education
Department of Curriculum and Instruction
University of Illinois
1310 S. Sixth Street
Champaign, IL 61820, United States

Duration: From August 1989 to May 1990

Funding: College of Education

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

In elementary schools in the Urbana School District:

- To improve the preparation of school teachers of kindergarten through sixth grade (5-11 years).

Implementation:

The elementary school teachers are assigned to a teacher/advisor within a school and are given three lengthy clinical experiences under the guidance of classroom teachers and university personnel. In addition, the students receive instruction in language and literacy, content area subject, curriculum and instruction, and mathemathics. These courses, taught collaboratively by an instructional team of Urbana teachers and University Faculty members, provide opportunities to relate clinical practice to method work. Students' course work and field experiences are designed and implemented by the four instructional teams. Each student's development and progress is monitored by a joint teacher/Faculty team.

The Advisory Committee meets regularly (it consists of student teachers, public school teachers, Faculty members and principals).

Products:

Report to be instrumental in training primary school teachers.

Final report of first year December 1990.

UNIVERSITY OF MARYLAND
CENTER FOR INSTRUCTIONAL DEVELOPMENT AND EVALUATION

Title of project: INSTRUCTIONAL FRAMEWORK

Person to contact: Scott Burg
Centre for Instructional Development and Evaluation
University of Maryland
University Boulevard and Adelphi Road
College Park, Maryland, United States

Tel. 1 207 421 616

Duration: From May 1990 to June 1991

Funding:
- Chapter II Federal Grant
- Maryland State Department of Education
- University of Maryland

Associated Universities: None

BRIEF DESCRIPTION OF THE PROJECT

Aims:

At all levels of the curriculum, from pre-primary to adult education:

- To develop a multimedia interactive resource for teachers called the Instructional Framework;
- To help contribute to the expansion and refinement of a teacher's repertoire of teaching strategies while guiding instructional decision making.

Implementation:

The schools have not yet been selected: it is planned to include a rural, suburban and urban school.

The Instructional Framework consists of three major components: an electronic database containing information related to effective instruction; an electronic communications link to state and national bulletin boards; a series of videotaped illustrations of research-based teaching behaviours and expert testimony that is accessed via interactive videodisc.

This delivery system to be set up at different school sites, will allow teachers to maintain a measure of control over their own professional development in technology integration in classrooms. Information accessible through the system will be available at times convenient to the teacher and can be explored according to the teacher's needs and individual schedule. Information on particular instructional strategies can be accessed through a number of different variables: learning level (grade), content area, special population and instructional emphasis (a particular content topic).

The project will also be piloted at a staff development centre and one or two education and training facilities.

Products:

Final report summer 1991.

UNIVERSITY OF PITTSBURGH
REGIONAL COMPUTER RESOURCE CENTER

Title of project:	INFORMATION TECHNOLOGY FOR THE COMMONWEALTH OF PENNSYLVANIA
Person to contact:	Albert P. Nous Regional Computer Resource Center University of Pittsburgh 1N10 Forbes Quadrangle Pittsburgh, PA 1520, United States
Duration:	From November 1984 to June 1992
Funding:	Pennsylvania Higher Education Assistance Agency
Associated Universities:	Clarion, Lehigh, Penn State, Temple West Chester Universities

BRIEF DESCRIPTION OF THE PROJECT

Aims:

For K-12 grade pupils (5-18 years) in 41 public school districts (public, private and parochial schools) in the Commonwealth of Pennsylvania:

- To raise the computer literacy of the teachers.

Implementation:

The Regional Computer Resource Center began operation in 1984, and is one of fourteen RCRCs located across the State of Pennsylvania. It was chosen as a site to introduce computers into the mathematics/science curriculum. The Centre has offered microcomputer speciality courses and workshops for science teachers in topics such as interactive video, laboratory interfacing, computer simulation, tele-communication, desktop publishing and developing higher order thinking skills using a database. Since then, additional courses have been instituted using software packages in art, biology, business, careers, chemistry, English, mathematics, science, reading, social studies and language arts, as well as for word processing, database and spreadsheets. Equipment includes the Apple IIe, IIc, IIGS, Macintosh II, IIX with Graphic Scanner, Macintosh Plus, Macintosh SE, IBVM, PC, Commodore Amiga, Tandy 1000 and 3000 and NCR (IBM compatible). The hardware demonstrates Appleshare and Digicard Network systems. There are tele-communication systems, a color plotter, digitizer, interfacing peripherals and software, interactive video systems and CD-ROM technology.

The legislative mandate of the Centre is service. Research conducted is a complementary activity only engaged in by Universities housing RCRCs. The Pitt-RCRC works in close conjunction with the Buhl Science Center and the NASA Teachers Resources Center. The Pennsylvania Regional Centre for Science Teachers is now housed at PITT-RCRC. This program received strong support from the State legislature.

Products:

Quarterly reports, for each year of operation.